

Sl.no.

Pages 3

037

AGRICULTURE

PAPER-I

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Instruction: Candidates must attempt FIVE questions but at least TWO from each section.

SECTION-A

1. Answer Any Two of the following in not more than 250 words each :

25x2=50

a) Describe the factors of Soil Formation

b) Explain the Climatic elements as factors of crop growth

c) Role and importance of Agricultural Extension for agricultural development

2. a) Describe various steps to be taken for efficient water management highlighting Drip and Sprinkler Irrigation systems.

25

b) What do you mean by Farm Management ? Elaborate its scope, importance and characteristics.

3. a) Explain the principles of soil fertility and the procedure for its evaluation to decide judicious use of fertilizers.

25

b) Describe the role of cooperatives in augmenting the agricultural economy of Meghalaya.

25

[1] - [13]

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4. Write short notes on Any 4 (FOUR) of the following : 12.5x4=50

- 4 Ps of marketing for agricultural produce
- Role of NGOs and SHGs for rural development
- Importance of Multiple Cropping for enhancing Cropping Intensity
- Integrated Nutrient Management
- Green House Effects and Global Warming

SECTION-B

5. Answer Any 2 (TWO) of the following questions: Your answers should not exceed 250 words. 25x2=50

- Discuss the concept of 'Dryland Agriculture' and its problems.
- Explain the criteria of scheduling irrigations. Describe the ways and means of reducing run-off losses of irrigation water.
- Discuss the effect of industrial effluents on soil and water pollution.

6. Answer Any 2 (TWO) of the following : 25x2=50

- State the Package of Practices of Rice highlighting the critical stages of growth.
- What is soil ? Explain the mineral and organic constituents of soil and their role in maintaining soil productivity.

c) What are Krishi Vigyan Kendras ? Explain their role in dissemination of agricultural technology mentioning its mandates.

7. Briefly explain the following :

10x5=50

- a) Sustainable management of natural resources.
- b) Methods of Weed Management
- c) Soil Conservation planning on Watershed basis
- d) Climate change and various international conventions and global initiatives to combat it
- e) Distinguish between Social Forestry and Agro Forestry

8. Answer Any 2 (TWO) of the following :

25x2=50

- a) Describe the major cropping patterns followed in different agro-climatic zones in the country
- b) What are Problem soils and explain the methods of their reclamation
- c) Describe various marketing management strategies for development.

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Pages 3

**AGRICULTURE
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS**

The figures in the margin indicate full marks for the questions

Instruction : Candidates must attempt FIVE questions but at least TWO from each section.

SECTION-A

1. Answer Any Two of the following in not more than 250 words each :

25x2=50

a) Describe the Cell Organelle and their functions with a diagram.

b) Explain the role of bio technology in Plant Breeding.

c) Narrate the physiology of seed germination and dormancy.

2. a) Critically analyse the climatic requirements and cultivation practices of any two major fruits having high potential in Meghalaya.

25

b) Define photosynthesis and explain the factors affecting the process.

25

3. a) What do you mean by Seed certification ? Why is it important ? Narrate the history of seed certification in India.

25

b) Describe the role of fruits and vegetables in human nutrition citing examples of few.

25

4. Write short notes on Any 4 (Four) of the following :

12.5x4=50

550

- a) Storage pests and diseases of rice
- b) Hybrid Vigour and its exploitation
- c) Cell Theory
- d) Handling and marketing problems of fruits and vegetables
- e) Reasons of grain surplus

SECTION-B

5. Answer Any Two of the following questions. Your answers should not exceed 250 words.

- a) Discuss the concept of Integrated Pest Management
- b) Explain various auxins and hormones in plants and other plant growth regulators.
- c) Discuss the food grain productivity status in India till 2017-2018 in relation to its food security.

- 6. a) Explain the Laws of heredity and their significance in plant breeding. 25
- b) Describe the seed production and the seed processing procedures. 25

7. Briefly explain the following :

10x5=50

- a) WTO issues and its impact in Agriculture
- b) National Dietary guidelines and food consumption pattern in India

c) Role of Inter-specific and Inter generic hybridization.

d) Physiology and its significance in agriculture.

e) IPR issues in Plant Breeding.

8. Answer Any Two of the following :

25x2=50

a) Describe the principal methods of preservation of few important fruits and vegetables of Meghalaya.

b) State the measures for Biological control of pests and diseases.

c) Explain how have the principles of Plant Breeding been applied in the improvement of major field crops.

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Pages 2

ANIMAL HUSBANDARY AND VETERINARY SCIENCE

PAPER-I
(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

Instructions :

- i) Question No. 1 is compulsory.
- ii) Candidates must attempt ANY FOUR questions out of the remaining Six questions.

1. Explain the following : (Any Five) 5x10=50

- a) Classes of Livestock Feed with examples
- b) Importance of Minerals in animal body
- c) 3 common methods of semen collection
- d) Various identification methods of farm animals
- e) Factors influencing fertility during A.I.
- f) Pampiniform plexus in male animals
- g) Functions of Blood

2. What are 'Nutrients' ? Discuss the occurrence of these Nutrients in feed and their role as constituents of feed in the nutrition of animal body.

10+20+20=50

3. Give a detailed explanation about the various factors affecting the yield and composition of milk in animals.

50

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4. Explain in detail Close Breeding and Line Breeding citing their various advantages and disadvantages. Discuss the consequences of Inbreeding in general. $15+15+20=50$

5. What do you understand by the term 'Hormones'? How are they different from Enzymes? Discuss briefly the general mechanism of action of Hormones with regards to the Hypothalamus, Anterior Pituitary and Posterior Pituitary functions. $10+10+10+10+10=50$

6. Discuss Mitosis and Meiosis in animal body. What are the differential characteristics between Mitosis and Meiosis? $30+20=50$

7. What are the advantages and limitations of A.I. as compared to Natural Breeding? Discuss in detail the components of semen. $20+30=50$

008

Pages 3

ANIMAL HUSBANDARY AND VETERINARY SCIENCE
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

Instructions :

- i) Question No. 1 is compulsory.
- ii) Candidates must attempt ANY FOUR questions out of the remaining Seven questions.

1. Write short notes on : (Any Five)

5x10=50

- a) Avian influenza virus and its effects on human health and poultry industry.
- b) Adulteration in meat trade and the techniques to identify it.
- c) Clinical examination of cranial nerves in cattle.
- d) Discuss about air sacs in fowl and its significance.
- e) Judging and grading of milk products.
- f) Rules for post mortem examination of a veterolegal cases.
- g) Scope of rabbit meat production and its utilization in India.

2. a) Discuss in detail clinical manifestations of diseases of nervous system in cattle.

20

- b) What role is played by pulmonary circulation in the body? How are oxy-

2-

- gen and carbondioxide gases exchanged in this process ? 15
- c) Explain the relationship between industrialization and animal agriculture. 15
3. a) Explain in detail the mechanism, clinical symptoms and treatment of cyanide poisoning. 20
- b) Describe the clinical manifestation of vitamin deficiency in poultry. 15
- c) Describe about regulation of hormone secretion in animals. 15
4. a) Discuss the predisposing factors, symptoms, diagnosis and treatment of milk fever in cattle. 20
- b) Elaborate the role of primary (village level) milk collection societies in the country and write about milk collection practices followed by them. 15
- c) Discuss in detail various types of vaccine. Also enlist the diseases against which vaccines are available in India. 15
5. a) Mention different haematobiochemical test in relation to disease diagnosis in animals. 20
- b) Furnish in detail the techniques for preparation and processing of animal tissue for histo-pathological examination in a laboratory. 15
- c) How is urine formed ? Discuss the role of aldosterone and antidiuretic hormone in this process. 15
6. a) Describe clinical manifestation, treatment and prevention of PPR in goats. 20
- b) Discuss the predisposing factors, symptoms, diagnosis and treatment of milk fever in cattle. 15

3

- e) Describe the clinical manifestation of vitamin deficiency in poultry. 15
7. a) Write down the methods of stunning and explain electrical stunning in small and large animals. 20
- b) Discuss briefly the following meat preservation methods and shelf life :
Curing, chilling, canning and irradiation. 10
- c) Name the important by-products from slaughter house with their economic uses. 10
- d) Give a brief outline of the chemical composition and nutritional content of poultry meat. 10
8. a) Write in detail about collection of biological samples for laboratory investigation and their procedure. 20
- b) What is the importance of extension programme in Indian farming system? What are the different methods utilized by extension workers in training farmers ? 20
- c) What is epidemiological measure ? Write the applications of epidemiology in disease control. 10

Sl.no.

005

Pages 2

ANTHROPOLOGY
PAPER-I
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

The figures in the margin indicate full marks for the questions.

Instructions : Candidates should attempt Question No. 1 which is compulsory and **FOUR** of the remaining questions, selecting at least Two/One from each section.

SECTION-A

1. Write short notes on Any TWO of the following in about 200 words each : 50

- a) Synthetic theory of evolution
- b) Bride-price
- c) Structural-functionalism
- d) Genetic load

2. What are the most distinctive features of the Neolithic culture in Eastern India ? Write about the tool types that characterise North-East India. 25+25=50

3. Illustrate genealogical method with an example. Discuss its importance in anthropological research. 25+25=50

4. What do you mean by Kinship system ? Explain how it forms the basis of social structure. 15+35=50

SECTION-B

200

5. Write short notes on Any TWO of the following in about 200 words each : 50

- a) Forensic Anthropology
- b) Interview method for data collection
- c) Mesolithic period
- d) La-Chapelle-aux-Saints

6. Discuss with examples how mutation regulates the genetic composition of a population. 50

7. Attempt a brief discussion on the concepts of Social Structure and Social Organization. How are they related to each other ? 30+20=50

8. Define growth and explain how is it different from development. Discuss the scope of human growth and development in human Biological Anthropology. 20+30=50

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002

Pages 2

ANTHROPOLOGY

PAPER-II

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions.

Instructions : Candidates should attempt Question No. 1 which is compulsory and **FOUR** of the remaining questions, selecting at least Two/One from each section.

SECTION-A

1. Write short notes on Any **TWO** of the following in about 200 words each :

50

- a) Mesolithic cultures of India
- b) Regionalism and Communalism
- c) Other Backward Classes
- d) Social change and continuity

2. Indicate the differences between Vedic Varna and Caste in contemporary India.

50

3. What do you mean by democratic institutions ? Discuss the impact of modern democratic institutions on the tribal societies of India. 20+30=50

4. Is 'tribe' a colonial construct ? How does the post-colonial India deal with tribes.

50

SECTION-B

5. Write short notes on Any TWO of the following in about 200 words each : 50

- Purushartha
- Tribe-caste continuum
- Detribalization
- Dominant caste

6. What is the role of NGOs in tribal development ? Discuss. 50

7. Briefly discuss the role of anthropology in rural development. 50

8. How do you define ethnicity ? Discuss in brief any one of the ethnic movements in North-East India. 10+40=50

Sl no

Pages 3

001

BOTANY
PAPER-I
(OPTIONAL)
MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Instructions :

- i) Candidates must attempt Question Nos. 1 and Any Four questions from the rest, selecting atleast Two from each section.
- ii) Give well labelled diagrams to illustrate your answer wherever necessary.

1. Write short notes on the following :

10x5=50

- a) Bacteriophage replication
- b) Economic importance of Algae
- c) Polyembryony
- d) International code of Botanical Nomenclature
- e) Totipotency

SECTION-I

2. a) Describe in detail the modes of genetic recombination in bacteria. 20

b) Describe the symptoms, disease cycle and control measures of viral and bacterial diseases (one each). 20

c) Write a short note on physiology of parasitism. 10

3. a) Describe the range of thallus structure of Bryophytes with examples. 20

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b) Give an account of economic importance of fungi. 20

c) What is Stele ? Write the evolution of stelar ^{system} septem in pteridophytes. 10

4. a) Give a comparative account of natural and phylogenetic ^{systems} septems of classification. Mention their merits and demerits. 20

b) Describe the salient features of Poaceae and liliaceae. Comment on the economic importance of these families. 20

c) Describe anomalous secondary growth in any monocot stem. What is its significance in monocot stem. 10

5. a) Write short notes on the following : 10x2=20

- Application of microbes in agriculture
- Morphological characters of Bennettitales.

b) Explain the following terms :

- Papilionaceous Corolla
- Cyathium inflorescence
- Syngenesious stamen
- Campylotropous ovule

c) Give an illustrated account of the development of female gametophyte in angiosperms. 10

SECTION-II

6. a) Describe the various centres of the origin of cultivated plants given by Vavilov. What was the basis of his theory. 20

b) Describe the process of cultivation and processing of Tea. 20

c) Write a note on the importance of enthnobotany in Indian context. 10

✓7. a) What is somaclonal variation ? Discuss the potential of somaclonal variation in crop improvement. 20

b) What is 'Embryo rescue' ? Describe various tissue culture techniques to overcome post-fertilization crossing barriers. 20

c). Describe the methods for isolation of protoplast and discuss the significance of protoplast culture. 10

8. Write notes on :

10x5=50

a) Plants as source of drugs

b) Energy plantation

c) Botanical Gardens

d) Application of pollen haploids

e) Somatic hybrid

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029

Pages 3

**BOTANY
PAPER-II
(OPTIONAL)****MARKS : 250****TIME : 3 HOURS**

The figures in the margin indicate full marks for the questions

Instructions :

- i) Candidates must attempt Question Nos. 1 and Any Four questions from the rest, selecting atleast Two from each section.
- ii) Give well labelled diagrams to illustrate your answer wherever necessary.

1. Write short notes on the following : 10x5=50

- a) Ultra structure of prokaryotic cell
- b) Sex - linked inheritance
- c) Heterosis and its significance
- d) Coenzymes
- e) Phytoremediation

SECTION-I

2. a) Define prions and describe prion hypothesis. 20

b) Describe the structure and functions of chloroplast and Peroxisomes. 20

c) Describe the structure and behaviour of polytene chromosome. Mention its significance. 10

3. a) Give a brief account of steps involved in the translation of an mRNA into polypeptide in prokaryotes. 20

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b) Define apomixes and describe the use of apomixes in plant breeding. 20

c) Discuss the role of chloroplast in cytoplasmic inheritance. 10

4. a) Define hybridization. Describe various methods of hybridization in self-pollinated crops. 20

b) Discuss briefly the practical utility of genetic engineering in agriculture and medicine. 20

c) What are t-test and chi-square tests? Describe their importance and where they are used. 10

5. a) Describe the details of Meiosis-I with particular emphases on prophase-I. Give a comparative account of mitosis and meiosis. 20

b) Write short notes on :

- Standard deviation
- Coefficient of variation
- Correlation
- Regression

c) Describe the development and use of molecular markers in plant breeding. 10

SECTION-II

6. a) What are CAM plants? How do they differ from C4 plants. Give mechanism of carbon fixation in CAM plants. 20

b) What are the sources, deficiency symptoms and physiological functions of Nitrogen, Phosphorus, Potassium and Calcium in plants. 20

c) Give an account of biological nitrogen fixation in plants. 10

7. a) Discuss the causes and consequences of global warming and climate change. Explain what measures should be taken to overcome this problem. 20

b) Write a short account on : 10x2=20

i) Biosphere reserves

ii) Red Data Books

c) Describe the ecological and economic importance of forests. 10

8. Write short notes on (Any Five) : 10x5=50

i) Fire as an ecological factor

ii) Scope of social forestry

iii) Photoperiodism

iv) Senescence

v) Qualitative characters of plant community

vi) Role and application of growth substances in agriculture and horticulture

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Page: 5

001

CHEMISTRY

PAPER-I

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

Answer question 1 and Any Four from the rest :

1. a) A microscope using suitable photons is employed to locate an electron in an atom within a distance of $0.1 \text{ \AA}$. What is the uncertainty involved in the measurement of its velocity? [Given, Mass of electron = $9.1 \times 10^{-31} \text{ Kg}$] 10
- b) Write the IUPAC names of $\text{K}_3[\text{Fe}(\text{CN})_5(\text{NO})]$ and $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$. 4
- c) State Carnot's theorem. How can the efficiency of a heat engine be increased? Can the efficiency of a Carnot's engine be 100%? 6
- d) Draw the sketches representing d_{z^2} and $d_{x^2-y^2}$ orbitals with appropriate signs. 5
- e) What are liquid crystals? Name different kinds of liquid crystals and mention their characteristics and uses. 10
- f) Find out the number of unpaired electrons for d^3 configuration in weak and strong octahedral crystal fields and predict the corresponding magnetic properties. 5
- g) What are interhalogen compounds? Giving one example each, mention the different types of interhalogens formed. 6
- h) Draw the structures of $\text{Fe}_2(\text{CO})_9$ and Ferrocene. 4

[1] [2]

PTO

2. a) Solve Schrodinger wave equation for a particle in one-dimensional box and obtain the expression for eigen value (E) and eigen function (Ψ). What is the zero point energy of the particle in a one dimensional box? 20

b) Briefly state the important postulates of quantum mechanics. 10

c) What do you understand by polar and non-polar molecules? Explain why CO_2 and CCl_4 molecules are non-polar while CHCl_3 is polar. 10

d) Define the terms resonance and resonance energy. Draw the resonance structure of N_2O . 10

3. a) Draw the molecular orbital diagram of O_2 , O_2^+ and O_2^- . Give order of stability of these species with appropriate reasons. 15

b) Calculate the lattice energy of a salt MX from the data given below: 10

Heat of formation of MX = -550 kJ/mole

Heat of sublimation of M = 80 kJ/mole

Heat of dissociation of X_2 = 155 kJ/mole

Ionisation Enthalpy of M = 374 kJ/mole

Electron affinity of X = -343 kJ/mole

c) Derive the Bragg's equation $n\lambda = 2d \sin \theta$, where λ is the wavelength of the X-ray striking the plane of crystal at an angle θ , d is the interplanar distance and n is an integer known as order of reflection. 15

d) At room temperature, polonium crystallizes in a primitive cubic unit cell. If $a = 3.36 \text{ \AA}$, calculate the theoretical density of polonium. [Molar mass, M , of polonium = 209 g mol^{-1}]. 10

4. a) What are the causes of deviation of real gases from ideal behaviour? Derive van der Waals equation for real gases. What is the significance of van

der Waals constants, "a" and "b"? 5+10+5=20

b) Calculate the pressure exerted by one mole of carbon dioxide gas in a 1.32 dm^3 vessel at 48°C using van der Waals equation. The van der Waals constants are : $a = 3.59 \text{ dm}^3 \text{ atm.mol}^{-2}$ and $b = 0.0427 \text{ dm}^3 \text{ mol}^{-1}$. 10

c) Explain Maxwell's law of distribution of molecular velocities. What is the effect of temperature on distribution of molecular velocities? 10

d) Define surface tension of a liquid. Describe the capillary rise method for determining surface tension of a liquid. 10

5. a) Derive an expression for work done in isothermal reversible expansion of an ideal gas. 10

b) Derive an expression for entropy change of an ideal gas when temperature changes from T_1 to T_2 when (i) volume goes from V_1 to V_2 , and (ii) pressure changes from P_1 to P_2 . 15

c) State the Third Law of Thermodynamics. How can one determine the absolute entropy of a substance with the help of this law? 10

d) One mole of an ideal gas is heated from 100 K to 300 K . Calculate ΔS if the pressure is kept constant. Assume that $C_v = 1.5R$. 5

e) What is meant by partition function? Prove that complete partition function for a system is the product of translational, rotational, vibrational and electronic partition function. 10

6. a) Draw the labeled phase diagram of sulphur system and discuss its salient features. 10

b) Calculate the number of components, number of phases and degrees of

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Pages 6

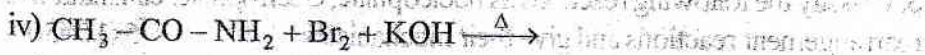
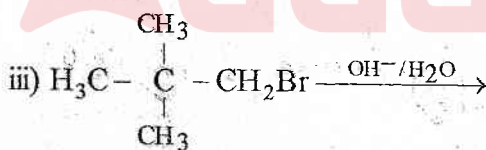
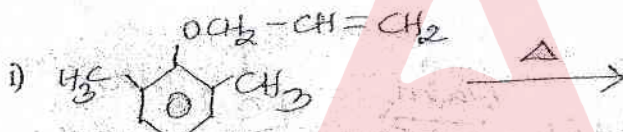
CHEMISTRY
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

The figures in the margin indicate full marks for the questions.

Assume suitable data if considered necessary and indicate the same clearly.

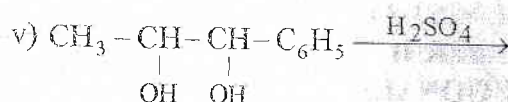
Answer Any Five questions :

1. Give the products, along with mechanism, of the following transformations and name the reaction involved. 5x10=50

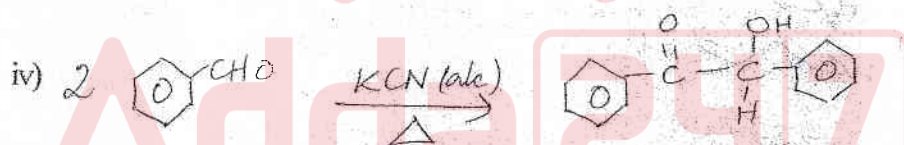
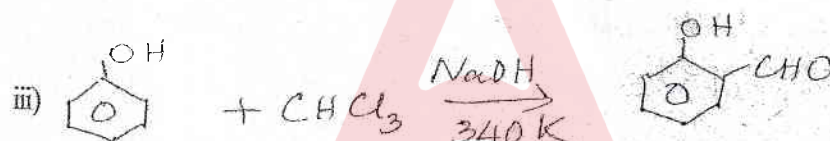
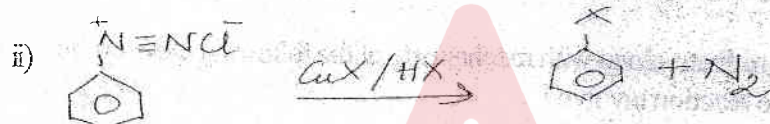
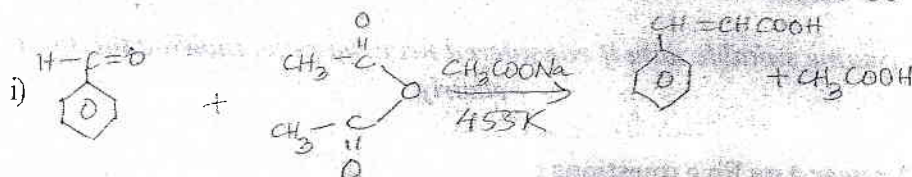


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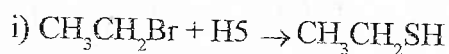
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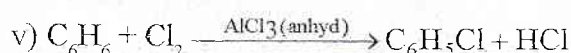
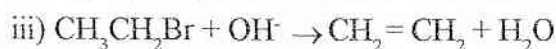
2. Name the following reactions and give their mechanism. Name the reactants and products involved in the reactions. 5x10=50



3. Classify the following reactions as nucleophilic, electrophilic, elimination or rearrangement reactions and give their mechanisms. 5x10=50



[2]



4. a) Which of the following species will exhibit aromatic character? Write their structural formula - Cyclooctatetraene, Tropylium ion, Cycloheptatrienyl anion, furan, cyclobutadiene. 10

b) Explain the method of formation and uses of the following polymers.

i) Nylon 6, 6 ii) Polyvinyl chloride (PVC) 10

c) What are carbenes? Discuss their formation and structure. 10

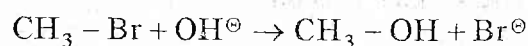
d) Define carbonium ion and carbanion and explain why a secondary carbonium ion is more stable than a primary one but a secondary carbanion is less stable than a primary. 10

e) Write notes on :

i) Nucleophilic reagents

ii) Electrophilic reagents 10

5. a) The alkaline hydrolysis of methyl-bromide to give methyl alcohol is a typical example of S_N^2 reaction 10



Discuss the mechanism of the reaction and justify why the reaction is designated as S_N^2 .

b) Discuss the effect of solvents on S_N1 reaction rate.

10

c) Discuss the mechanism of $E1cB$ reaction taking a suitable example.

10

d) What is Saytzeff's rule? Considering the reaction between 2-chlorobutane and alcoholic KOH, apply Saytzeff's rule to justify the formation of major and minor products.

10

e) What is the effect of activation energy on the structure of transition state in the halogenation of alkanes.

10

6. a) Explain fluorescence and phosphorescence by means of a labelled diagram.

10

b) What are Norrish type I or α -cleavage photochemical reactions?

10

c) Compounds A and B undergo photodecarbonylation resulting in the formation of I and II (from A) and III and IV (from B). Give the structures of I, II, III and IV and the mechanism of their formation.

20



d) Write a short note on Diels-Alder reaction.

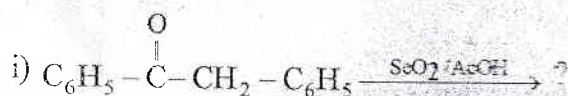
10

7. a) Discuss the structure of DNA. How does DNA differ from RNA with respect to nucleotide base and sugar.

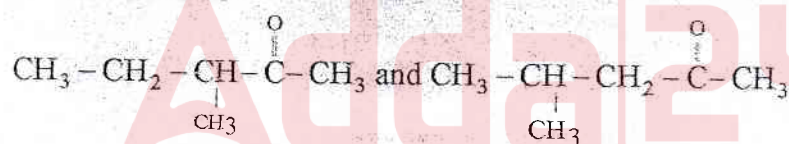
10

b) Write the structures for synthetic and natural rubbers. What is the difference between the two. 10

c) Complete the following equations and give suitable mechanisms to each. 3x10=30



8. a) Account for the various peaks observed in the mass spectrum of neopentane as $m/z = 72, 57, 41, 29$ and 27 . How would you distinguish between the following two isomeric ketones in the mass spectra 10

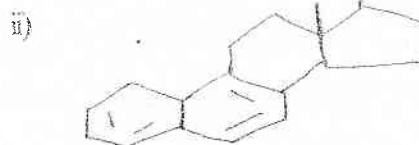
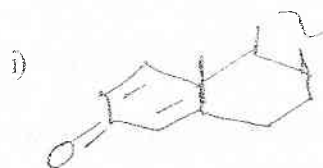


b) How would you use IR spectroscopy to distinguish between 10

i) a primary amine and a tertiary amine

ii) Cyclohexanone and α, β -unsaturated cyclohexenone

c) Applying Woodward-Fieser rules calculate the values of λ_{max} for the following compounds. 10



d) How many proton signals would you expect in the NMR spectra of the following compounds 10

- i) Cyclohexane
- ii) Toluene
- iii) Ethyl methyl ketone
- iv) Isopropyl bromide
- v) anhydrous ethyl alcohol

e) Discuss the effect of solvent in $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions in an organic compound. What are shielded and de-shielded protons? Explain with examples. 10

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SLNo.

Pages 10

004

**CIVIL ENGINEERING
PAPER-I
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS**

Answer Question No. 1 and Any Four from the rest.

1. a) List two objectives that are fulfilled by the use of air vessels in reciprocating pumps. 2+2=4
- b) How is the total energy converted into kinetic energy in a reaction turbine? 2
- c) In a centrifugal pump in which direction is the liquid admitted inside and how? 1+2=3
- d) Define a curb in a well foundation for bridges. 3
- e) Describe how ground improvement is carried out using stone column? 3
- f) Describe a test pile. 3
- g) Describe the polygon law of forces. 2
- h) Mathematically define the force components for a body to be moved in any one direction. 2
- i) State three laws of static friction. 3
- j) Determine the elongation of the bar hanging freely under its own weight, where L is the length, A cross sectional area, E Young's modulus of elasticity, w specific weight of the bar material. 3

[1]

PTO

k) What is a leaf spring and where is it commonly used ? 1+1=2

l) A point is subjected to a tensile stress of 60 N/mm^2 and a compressive stress of 40 N/mm^2 , acting on two mutually perpendicular planes and a shear stress of 10 N/mm^2 act on these planes. Determine the major principal stress.

3

m) According to Euler's theory for column, with usual notations, if the Crippling load is denoted as $2I\pi EI/L^2$, name the end condition for this case. 2

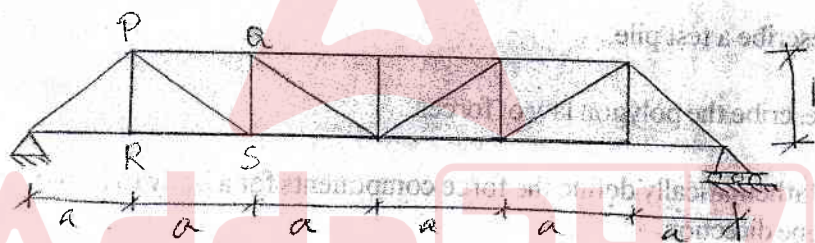
n) Determine the degree of freedom of an axially loaded rigid frame as shown below.

3



o) Draw the influence line diagram for internal axial force in member PS as shown below.

4



p) The stiffness matrix of a beam element is given as $\frac{2EI}{L} \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$, determine its Flexibility.

3

q) Name the criteria for a structure to fail in Limit State Method as per

[2]

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r) Evaluate the kinematic indeterminacy of a single bay portal frame fixed at the base. 2

2. a) Define a control volume. 2

b) A piston 796mm in diameter and 200mm long works in a cylinder of 800mm diameter. If the annular space is filled with lubricating oil of viscosity of .05 poise, calculate the speed of descent of the piston in vertical position. The weight of the piston and the axial load are 9.8N. 6

c) A pipe line carries oil of sp. gravity 0.83 at a velocity of 2m/s through a 20cm diameter pipe. At another section the diameter is 15cm. Find the mass rate of flow in the second section. 4

d) State the formation of a free vortex flow. 2

e) Pressures on the suction side and the discharge side of a pump are read by the Pressure gauge as vacuum of 25cm of mercury and 140 kN/m^2 respectively. The gauge on the suction side is placed at 60cm below the centre line of the pump where as the gauge on the discharge side is placed at 17cm above the centre line. If the diameters of pipes on suction and discharge sides are 15cm and 10cm respectively ; and the quantity of water to be pumped is 30 litres/second, calculate the power required for the pump. 5

f) A venturimeter with 30cm diameter inlet and 15cm throat is used for measuring flow of liquid of specific gravity 0.90. The oil mercury differential gauge shows a reading of 33cm. Assuming the coefficient of discharge of venturimeter is 0.98, calculate the discharge. 4

g) Describe the two limiting cases of Navier Stokes equations. 2+2=4

h) Describe how the flow of fluids of high viscosity takes place in boundary layer ? 3

i) Water flows over a rectangular weir 1m wide at a depth of 15cm and afterwards passes through a triangular right angled weir. Find the depth of water through the triangular weir. The discharge co-efficients for rectangular and triangular weir are 0.62 and 0.59 respectively. 5

j) Describe the types of turbulence in pipe flow. 4

k) Describe the effect of compressibility on Drag. 3

l) Explain the Buckingham's Pi theorem. 8

3. a) A body of weight 500N, is lying on a rough plane inclined at an angle of 25° with the horizontal. It is supported by an effort P parallel to the inclined plane. Determine the minimum value of P, for which the equilibrium can exist, if the angle of friction is 25° . 6

b) Determine the Moment of Inertia about the centroidal X-X axis of an inverted L Section, the top flange size is $10\text{cm} \times 2.5\text{cm}$ and web without flange is $12.5\text{cm} \times 2.5\text{cm}$. 10

c) A ball overtakes another ball of twice its own mass and which is moving with $1/7$ of its velocity. If the coefficient of restitution between the two balls is 0.75, show that the first ball will come to rest after impact with the second ball. 5

d) A simply supported beam 6m long is carrying a uniformly distributed load of 4t/m over a length of 2m from the right end and 6t/m over a length of 2m from left end. Draw the shear force and bending moment diagram and find out maximum bending moment. 3+4+2=9

e) An axial pull of 50kN is suddenly applied to a steel rod 2m long and 1000mm^2 in Cross section. Calculate the strain energy that can be absorbed if $E = 200\text{GN/m}^2$. 4

f) A horizontal girder of steel having uniform section is 14m long and is simply supported at its ends. It carries concentrated loads of 12t at 3m from left end and 8t at 4.5m from right end. I for the section of the girder is $160 \times 10^3\text{cm}^4$ and $E = 2.1 \times 10^6\text{kg/cm}^2$. Calculate the deflection of the girder under the load of 12t. 8

g) A shaft is transmitting 100kW at 180rpm. If the allowable stress in the material is 60N/mm^2 , determine the suitable diameter for the shaft. The shaft is not to twist more than 1° in a length of 3m. Take $C = 80\text{kN/mm}^2$. 8

4. a) Describe the meaning of uniformity co-efficient and co-efficient of curvature of soil. 2+2=4

b) Relative density and void ratio are the indicator of which parameter of the soil? Which is a better indicator of the two? 1+1=2

c) According to the Indian Standard Soil Classification System if a soil has a liquid limit of 60% and a plastic limit of 20%, which designation is assigned to that soil. 2

d) Describe the suitability of soil compaction by using sheep's foot roller. 2

e) Describe the effect of the size of soil particle on permeability. 2

f) Describe the formation of quick sand phenomenon & illustrate it with a sketch. 4+2=6

g) Discuss two aspects of the principle of effective stress. 2+2=4

h) State two points on the assumptions made in Terzaghi's Theory of One dimensional Consolidation. 2+2=4

i) A clay soil tested in a consolidometer shows a decrease in void ratio from 1.20 to 1.10 when the pressure is increased from 0.25 to 0.50 kgf/cm². Determine the co-efficient of volume compressibility. 3

j) Determine the shear strength in terms of effective stress on a plane within a Saturated Soil mass at a point where the total normal stress is 200 kN/m² and the pore water pressure is 80 kN/m². The effective shear strength parameters of the soil are $c' = 16 \text{ kN/m}^2$ and $\phi' = 30^\circ$. 3

k) A smooth vertical backed wall of 10m height retains a soil of having $\gamma = 20 \text{ kN/m}^3$, $\phi = 35^\circ$. The soil surface is horizontal and is level with the top of the wall and carries a uniformly distributed load of 50 kPa. Determine the total thrust per linear metre of the wall and its point of application. 4+1=5

l) Draw a curve showing components of total settlement. 3

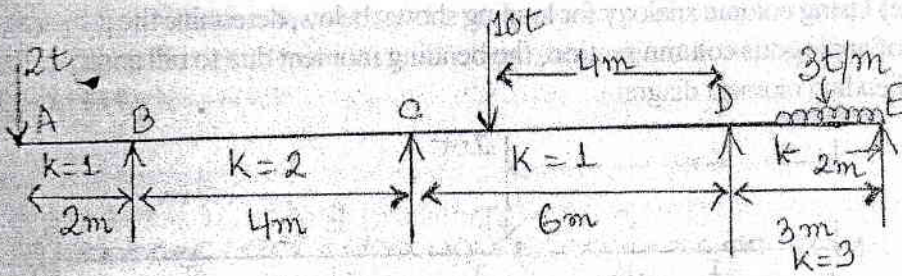
m) Describe local shear failure of soil? 2

n) When the slope is submerged in water, how is the effect of submergence accounted for in total stress analysis for slope stability? 3

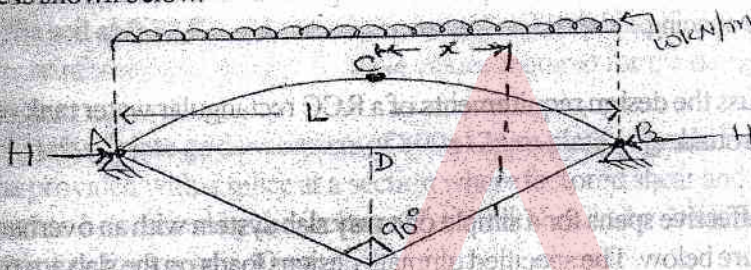
o) Which type of footing is considered for design if in addition to axial load, the Bending moment also has to be considered? 2

p) A rectangular area 2m x 4m carries a uniform load of 80 kN/m² at the ground surface. Determine the vertical pressure at 5m below the centre, consider the value of influence factor as 0.0328. 3

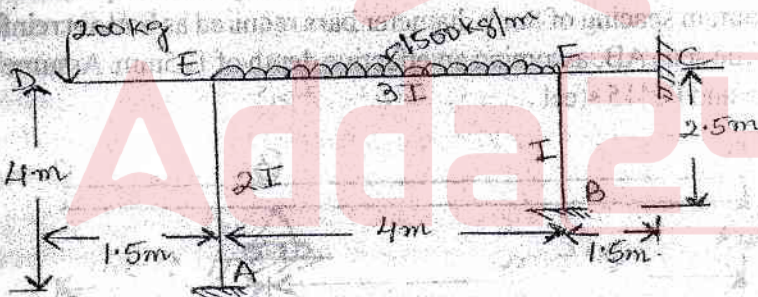
5. a) For the beam loaded as shown below, calculate the bending moments for two cycles by using moment distribution method. 12



b) A three hinged circular arch has a span length L and subtends at the centre of circular curve an angle of 90° . The third hinge is located at the crown. The arch is subjected to a uniformly distributed load of w kN/m on the plan length. Calculate the equation of the bending moment in the arch as a function of horizontal distance ' x ' from the crown the span length ' L ' and udl ' w ', the figure is shown below. 10

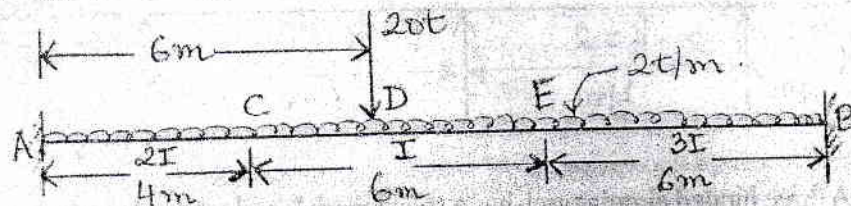


c) Use slope deflection method and determine the end moments for the frame as shown below. 12



d) Describe the conditions satisfying the Plastic Theory of Bending. 6

e) Using column analogy for loading shown below, determine the properties of analogous column section, the bending moment due to udl and draw its bending moment diagram. $4+4+2=10$



6. a) An RCC beam of rectangular cross section has a factored shear of 200kN at its critical Section. Its width 'b' is 250mm and effective depth is 350mm. Assume design shear strength 'c' of concrete as 0.62N/mm^2 and maximum allowable shear stress $c_{\max}$ in concrete as 2.8N/mm^2 . If two legged 10mm diameter vertical stirrups of Fe250 grade steel are used, determine the required spacing. 4

b) Discuss the design requirements of a RCC rectangular water tank resting on the ground. 4

c) The effective spans for a simple one way slab system with an overhang are as in figure below. The specified ultimate designs loads on the slab are 6.0kN/m^2 and 4.5kN/m^2 for dead loads and live loads respectively. Considering the possibility of live loads not occurring simultaneously on both span, determine the maximum spacing of 8mm diameter bars required as bottom reinforcement in the span AB, assuming an effective depth of 125mm. Assume M20 concrete and Fe415 steel. 8



d) Design a RCC column having an axial load of 400kN and a bending mo-

ment of 28 kNm about its centroidal axis, using the working stress method. Adopt cement concrete of Grade M25 and steel reinforcement of Fe 415 grade. Assume a suitable value of modular ratio. 14

e) A post-tensioned concrete beam of rectangular section 100mm wide and 300mm deep is stressed by a parabolic cable with zero eccentricity at the support and an eccentricity of 50mm at the centre of the span. The area of the cable is 200mm² and the initial stress in cable is 1200N/mm². If the ultimate creep strain is 30×10^{-6} mm/mm per N/mm² of stress and the modulus of elasticity of steel is 210GPa, compute the loss of stress in steel only due to creep of concrete. 7

f) Design a suitable isolated RCC footing for a square column of size 40cm x 40cm carrying a direct load of 450 kN. Take the safe bearing capacity of the soil as 0.3 MPa. Adopt M20 grade of concrete and Fe 415 grade of steel as reinforcement. Assume suitable values required for the design. 13

7. a) A web of plate girder consists of 800x12mm plate of grade Fe410 and is to be provided with a splice at a section where factored shear and bending moment to be resisted by the web are $V = 700\text{kN}$ and $M = 200\text{kN-m}$. The flanged plate thickness is 40mm each. Design a web splice. 12

b) Describe the procedure of designing a cement concrete abutment for a single span R.C.C. slab bridge of span = 7m. The soil at the foundation level may be taken as sandy soil and open foundation may be adopted. Describe the various forces to be considered while checking the stability of the abutment. The bridge may be considered to be located in a seismic region. Draw a neat diagram showing the section of the abutment and the various forces acting on it with their approximate points of application, for the case of high flood combined with seismic forces. 24

c) Draw a neat sketch showing a cross-section of a double lane National Highway in a hilly section, with an uphill slope on one side and a steep slope

on the downhill side. In this sketch indicate the carriageway, the roadway, and a stone masonry retaining wall of height 6.0m, and also a breast wall height 4.0m with dimensions. 14

8. a) What is a flownet in hydraulics and what are its characteristics? Describe the use of flownets. 10

b) The rate of flow Q of a liquid of density ρ and viscosity μ is to be measured by means of an orificemeter of diameter d installed in a pipeline of diameter D . The pressure drop across the orifice plate is Δp . Show by using the method of dimensional analysis that $Q = Cd^2 \sqrt{\Delta p / \rho}$, in which C is a discharge coefficient dependent upon the parameters $\rho Q / \mu d$ and d/D . 15

c) The plastic limit of a soil is 25% and its plasticity index is 8%. When the soil is dried from its state at plastic limit the volume change is 25% of its volume at plastic limit. Similarly the corresponding volume change from the liquid limit to the dry state is 34% of its volume at liquid limit. Determine the shrinkage limit and its shrinkage ratio with illustration. 4+3+4=11

d) Describe a falling head permeability test. Derive an equation for falling head permeability with a diagram. 3+7+4=14

Sl.no.

003

Pages 8

CIVIL ENGINEERING

PAPER-II.

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions.

Assume suitable data if considered necessary and indicate the same clearly. Symbols and notations have their usual standard meanings, unless otherwise mentioned. Wherever required, draw neat sketches and give examples to illustrate answers. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the answer book must be clearly struck off. Question Numbers must be written in full for each and every part of a question.

[Q.No.1 is compulsory and out of the remaining SEVEN questions, attempt any FOUR questions]

1. a) Mention any three characteristics of good clay bricks. 3
- b) Briefly explain seasoning of stone. 5
- c) In relation to network technique of project planning, differentiate between event and activity. 5
- d) Write a note explaining activity time estimates in PERT. 5
- e) The length of a line measured with a 20m long chain was found to be 120m. Calculate the true length of the line if the chain was 5cm too long. 3

f) The observed fore bearing of the line AB is $23^{\circ} 25'$ and the line PQ is N $23^{\circ} 25'$ E. Calculate their back bearings. 2+2=4

g) What is mean sea level ? 3

h) What is camber ? 3

i) With a neat sketch, explain the components of the hydrological cycle. 5

j) Define ϕ -index in hydrology. 3

k) Define unit hydrograph. 3

l) Derive a relationship among duty, delta and base period. 5

m) What is meant by consumptive use of water ? 3

2. a) Write a note on seasoning of timber. 5

b) Write the role of Bogue's compounds in the behaviour of cement ? 5

c) Briefly explain hydration of cement. 3

d) Write the functions of a power shovel hoe. 5

e) State Abram's law of water cement ratio. 3

f) With a neat sketch of the stress-strain curve, explain the behaviour of concrete under compression. 5

g) Draw simple sketches to show the following timber trusses used in roofs

i) king post truss ii) queen post truss 2x3=6

- h) Write a short note on design of energy efficient buildings. 5
- i) PERT calculations for a project gives project completion time as 60 weeks with a variance of 9 weeks. Estimate the number of weeks required to complete the project with a probability of 95%, given the value of the normal deviate corresponding to 95% probability as 1.647. 5
- j) Life of a building is 80 years. Two choices are available for a particular component of the building.
Choice A: Initial cost = Rs.40,000. Replacement cost = Rs.60,000. Life of the component 20 years.
Choice B: Initial cost = Rs.80,000. Replacement cost = Rs.1,00,000. Life of the component 40 years.
Based on present worth, choose the more economical choice. Take rate of interest as 8%. 8
3. a) In relation to levelling, what is back sight? 2
- b) What is contour interval? 2
- c) An instrument was setup at P and the angle of elevation to a vane at 4m above the foot of staff held at Q was $7^{\circ}30'$. The horizontal distance between P and Q was known to be as 1530m. Determine the RL of the staff station Q given that the R.L. of the instrument axis was 100.50m. Take error due to curvature and refraction, $C = 0.06728 D^2m$, where D is the horizontal distance between the two points P and Q in km. 6
- d) In aerial photogrammetry, what is the difference between a tilted photograph and an oblique photograph? 3
- e) Write the functions of a transition curve. 5
- f) Draw a typical cross section of a permanent way in railways to show its

major components.

g) Define gauge of a railway track.

h) Explain the usefulness of coning of wheels.

i) Calculate the gradient for B.G. track such that the grade resistance together with the resistance due to a curve of 2 degree shall be equal to the resistance due to a ruling gradient of 1 : 200.

j) What are the principles of highway planning?

k) A vehicle travelling at a speed of 36 kmph was stopped by applying brakes. The skid length was found to be 5.20 m. Find the average skid resistance of the pavement surface.

l) Write a brief note on Low Cost roads.

4. a) Explain the term surface runoff.

b) What is flood routing?

c) In relation to ground water terminology, define specific yield.

d) Draw a neat sketch to show different types of aquifers.

e) In irrigation what is meant by gross command area?

f) How does the trap efficiency of a reservoir affect the life of the reservoir?

g) The isohyets for annual rainfall over a catchment basin were drawn and the areas between strips of isohyets are as follows. Find the average depth of annual precipitation over the catchment.

Rainfall (cm)	70-80	80-90	90-100	100-110	110-120	120-130
Area in sq. km	350	450	1590	700	500	390

h) The analysis of the maximum one-day rainfall depth at a station indicates that a depth of 200mm has return period of 25 years. Determine the probability of a one-day rainfall depth equal to or greater than 200mm at that station occurring at least once in 20 years. 5

i) A well fully penetrates into a homogeneous unconfined aquifer having a saturated depth of 80m. The discharge is 200 litre per minute at drawdown 10m. Assuming equilibrium flow conditions, estimate the discharge at 15m drawdown. Assume that the distance from the well where the drawdown influences are not appreciable is same for both the cases. 8

j) With neat sketches, describe the techniques of irrigation water distribution in the farms. 12

5. a) Mention the common impurities found in natural sources of water and explain their effects upon the quality of water. 10

b) Write a brief note on the Indian Standards of potable water. 7

c) In a water treatment plant, 20000 litre of water is treated per day and chlorine usage is 6 kg/day. If residual chlorine after 10 minute contact is 0.1 mg/l, determine the chlorine demand of the water. 5

d) Differentiate between combined system and separate system of sewerage. 3

e) Write a brief note on COD. 5

f) A 2% solution of a sewage sample was incubated for 5 days at 20°C. The

depletion of oxygen was found to be 4 ppm. Determine the BOD of the sewage.

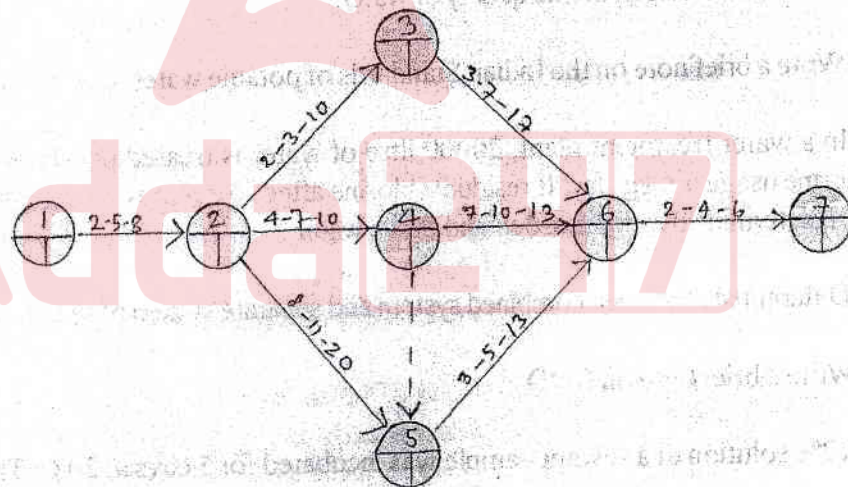
g) In a water supply scheme for serving a town with a population of 4 lakhs, the storage reservoir is placed at a distance of 5 km. The loss of head from the source to the city is 8m. Calculate the size of the supply main using Darcy-Weisbach formula. Assume daily per capita demand as 200 litres and coefficient of friction for Darcy-Weisbach formula as 0.012.

6. a) What is hydraulic cement ?

b) What is pusher gradient ?

c) Write a note on light weight concrete.

d) The time estimates in days for optimistic, most likely and pessimistic times of various activities are shown in the network diagram given below. Calculate the event times and find the critical path using slack philosophy. Take scheduled time of the project to be same as the latest allowable time for the final event.



- e) What are the main uses of Tachometry? 3
- f) Describe the components of highway drainage. 12
- g) Sketch a left hand turnout in railway track showing the details. 5
- h) Calculate the stopping sight distance for a road which has a design speed of 60 kmph. Take braking efficiency as 50% and the total reaction time of the driver as 2.75 seconds. 5
7. a) What are the techniques of forecasting vehicular traffic? 5
- b) Using Kennedy's method, design a trapezoidal irrigation channel with side slope $1H : 1V$ to carry 50 cumec of discharge. The channel is to be laid at a slope of 1 in 4000. The critical velocity ratio for the soil is 1.1. Take Kutter's rugosity coefficient = 0.023. Assume an initial depth = 2.5m. 12
- c) What is a regime channel? 3
- d) With neat sketches discuss the modes of failure and criteria for structural stability of gravity dams. 12
- e) Design a sewer to serve a population of 40,000. The daily per capita water supply is 200 litre of which 80% finds its way into the sewer. The slope available is 1 in 600. The sewer is to be designed for four times the dry weather flow when running full. Assume Manning's $n = 0.012$. 12
- f) Briefly explain the classification of river training works based on the objectives. 6
8. a) Explain the principle of the compaction factor method of determining workability of fresh concrete. 5
- b) Write a brief note on effects of orientation on planning a building. 5

- c) Sketch a joint of fish plates with rails. 5
- d) What is interlocking in railway tracks? 3
- e) What are the different types of traffic signs used in highways? 3
- f) Write the purposes of pavement markings. 3
- g) Explain the function of sheet piles used in diversion head works. 4
- h) Write a brief note on the principles of highway planning in India. 5
- i) Write a brief note on causes of water logging in urban areas and how the water logging may be controlled. 5
- j) Briefly describe different layouts of water supply distribution networks. 12

Sl.no.

009

Pages 5

COMMERCE & ACCOUNTANCY

PAPER-I

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

Candidates should attempt Question Nos. 1 and 5 which are compulsory and Any Three of the remaining questions selecting at least One question from each Section.

SECTION-I

1. a) XYZ Limited purchased fixed assets worth Rs. 90,00,000 on 1st April, 2014. The life of the assets is 10 years and they are to be depreciated on straight line basis. The assets were re-valued on 1st April 2016 when 50% of the assets was assessed at 10% less than the book value, and the remaining assets were re-valued at 15% higher than book value. The assets were ultimately sold on 1-4-2018 for Rs. 54,80,000. Excess depreciation on revaluation, if any, should be charged to Revenue Reserve. Show Fixed Assets A/c, Depreciation A/c and Revaluation Reserve A/c supported by workings where ever necessary.

b) Why do companies amalgamate?

OR

a) The under mentioned costs are incurred in each of the three years, 2016, 2017 and 2018 when output annually is 10,000 units.

Materials	Rs. 6,00,000
Labour	Rs. 3,50,000
Variable Factory Overheads	Rs. 1,50,000
Fixed Factory Overheads	Rs. 2,00,000
Total	Rs. 13,00,000

[11]

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In 2016 only 8,000 units were sold, in 2017 sale was 10,500 units and in 2018 it was 11,500 units. The selling price is uniform at Rs. 150 per unit. Prepare a statement of profit and loss under Marginal Cost for Years 2016, 2017 and 2018.

40

b) Write a note on Responsibility Accounting.

10

2. Calculate the tax liability of Mr. X for AY 2019-2020 from the following details :

(a) Net House Property income calculated under the head "Income from House Property" ₹. 3,70,000	
	Amt. in ₹.
(b) Income from business before adjusting the following:	90,000
(i) carry forward business loss	70,000
(ii) current depreciation	30,000
(iii) carry forward unabsorbed depreciation	1,40,000
(c) Short-term capital gain - Jewellery	1,60,000
(d) Long term capital loss - Shares	40,000
(e) Long term capital gains - Debentures	2,00,000
(f) Dividend on Shares held as Stock in Trade	10,000
(g) Dividend from a company carrying on Agricultural Operations	12,000
Income from growing and manufacturing coffee (cured and roasted: Consider 60% as agricultural income)	1,00,000

During Previous Year 2018-19, the Assessee had donated Rs. 35,000 to an approved local authority for promotion of Family Planning and purchased NSC VIII issue for Rs. 1,00,000.

50

3. Discuss the problem arising in determination of profits (under Audit of divisible profits).

50

4. Write short notes on Any Two of the following with examples :

2x25=50

- a) Clubbing of Income
- b) Cost-Profit-Volume Analysis
- c) Cash Flow Statement
- d) Responsibility Accounting

SECTION-II

5. The following details are provided by XYZ Limited :

Equity Share Capital	Rs.65,00,000
12% Preference Share Capital	Rs.12,00,000
15% Redeemable Debentures	Rs.20,00,000
10% Convertible Debentures	Rs.8,00,000

The cost of equity capital for the company is 16.30% and income tax rate of the company is 30%. You are required to calculate the Weighted Average Cost of Capital (WACC) of the company. 50

OR

The following information is extracted from the records of CANJB Limited:

	Amount in Rs./Unit
Raw materials	45
Direct labour	20
Overheads (Exclusive of Depreciation)	40
Total	105
Profit	15
Selling Price	120

- i) Raw materials are in stock on an average of two months.

- ii) The materials are in process on an average for 4 weeks. The degree of completion is 50%.
- iii) Finished goods stock on an average is for one month.
- iv) Time lag in payment of wages and overheads is one and a half weeks.
- v) Time lag in receipt of proceeds for debtors is two months.
- vi) Credit allowed by suppliers is one month.
- vii) 20% of the output is sold against cash.
- viii) The company expects to keep a cash balance of Rs. 1,00,000.
- ix) Take 52 weeks per annum. The company is poised for a manufacture of 1,44,000 Units in the year. Prepare the statement showing the working capital requirements of the company. 50

6. a) Calculate the operating leverage, financial leverage and combined leverage from the following data under Situation-I and Situation-II and Financial Plan A & Plan B and make your comments. 35

Installed Capacity	4000 units
Actual Production and Sales	75% of the capacity
Selling Price	Rs. 30 per unit
Variable cost	Rs. 15 per unit
Fixed cost : Under Situation-I : Rs. 15000 ; Under Situation-II : Rs. 20000	
Capital Structure :	

Particulars	Plan A	Plan B
Equity	Rs. 10000	Rs. 15000
Debit (Rate of Interest @ 20%)	Rs. 10000	Rs. 5000
Total	Rs. 20,000	Rs. 20000

b) Discuss Liquidity and Profitability in Financial Decision. 15

7. a) A company proposes to install a machine involving a capital cost of Rs. 3,60,000. The life of the machine is 5 years and its salvage value at the

end of the life is nil. The machine will produce the net operating income after depreciation of Rs.68,000 per annum. The company's tax rate is 45%. The present value factors for 5 years are as under :

Discounting Rate	14%	15%	16%	17%	18%
Cumulative Factor	3.43	3.35	3.27	3.20	3.13

You are required to calculate the internal rate of return of the proposal. 35

b) Explain the role of Capital Markets. 15

8. Write short notes on Any Two of the following : 2x25=50

- a) Modigliani and Millar Approach
- b) Capital Rationing
- c) Consortium Finance
- d) Short-term financing

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007

Pages 2

COMMERCE & ACCOUNTANCY**PAPER-II****(OPTIONAL)****MARKS : 250****TIME : 3 HOURS**

Candidates should attempt Question No. 1 which is compulsory and Any Four of the remaining questions selecting Two questions from each Section.

SECTION-A

1. Define Motivation. Give an account of Maslow's Theory of Need Hierarchy. 50
2. Describe briefly the functional areas of management. 50
3. What is strategic planning. State the features of strategic planning. Describe the process of strategic planning. 50
4. Describe F.W. Taylors' contribution to the development of Management thought. 50

SECTION-B

5. Describe the various statutory rules which are to be taken into consideration in case of fixation of wages in India. 50
6. Critically analyze the growth of Trade Union movement in India in the post globalization period. 50

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PTO

7. Clearly bring out merits and demerits of the migratory nature of industrial labour in India. 50

8. Describe the scheme of Workers Participation in Management (WPM). What is its status in India presently. 50

Candidates should attempt Questions 7 & 8 which is compulsory and any four of the remaining questions selecting two questions from each section.

1. Define Motivation. Give an account of Maslow's Theory of Need Hierarchy. 20

2. Describe briefly the functions of a manager. 20

3. What is strategic planning. State the importance of strategic planning. Describe the process of strategic planning. 20

4. Describe W. Taylor's contribution to the development of Management. 20

5. Describe the various strategies which are to be taken into consideration in case of fixation of wages. 20

6. Critically analyse the growth of Indian economy during the post-independence period. 20

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Pages 1

ESSAY
PAPER-I
(COMPULSORY)
MARKS : 250
TIME : 3 HOURS

(Examiners will pay special attention to the candidate's grasp of the material, its relevance to chosen subject and his/her ability to think logically and effectively.)

Write an essay on Any One of the following topics :

1. Freedom of Expression : Its Use and Abuse
2. Growing Population is a significant problem in a Developing economy.
3. Sports today is more of an industry than a form of entertainment.
4. The importance of Solid Waste Management.
5. Billions spent on space-research is a wasteful expenditure.
6. Your vision of Meghalaya after a decade

Sl.no.

Pages 2

015

ECONOMICS
PAPER-I
(OPTIONAL)

MARKS : 250**TIME : 3 HOURS**

Answer Question No. 1 which is compulsory and Any Four from the rest.

1. a) Describe the concept of comparative advantage in international trade. Explain the role of terms of trade in generating surplus or deficit.

b) Explain the concept "Trade as an engine of growth".

c) Give a brief account of product cycle and strategic trade theories.

20+15+15=50

2. Outline the features of monopoly, monopsony, bilateral monopoly and monopolistic competition. Describe how price is determined under monopoly, monopsony and bilateral monopoly markets. Explain how price discrimination takes place in a monopoly market.

15+20+15=50

3. a) Distinguish between a central bank and a commercial bank. Explain the role of non-banking financial institutions in Indian money market.

b) Describe Say's Law and its implication.

c) Give an account of real cash balance hypothesis in establishing full employment equilibrium.

20+15+15=50

4. a) Describe the main features of neo-classical theory of economic growth. Explain how Harrodian knife-edge instability is solved in Solow and Cambridge models.

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b) Outline the major components of human resource development. Explain how human development helps in innovation and development. 30+20

5. Critically examine the role of public finance in market economy for stabilization and supply stability. Outline various sources of government revenue and its changes in recent past. Also analyse incidence and effects of various taxes. 20+10+20=50

6. a) Distinguish between Balance of Trade and Balance of Payment. Analyse the mechanism for the adjustment of deficit in Balance of Payment.

b) "Balance of payment is always balanced" - Explain the concept.

c) Describe the role of WTO in the promotion of world trade. Also explain the role of TRIPS and TRIMS in world trade. 20+15+15=50

7. a) Explain the relationship between development and environmental quality. In this context describe Environmental Kuznets Curve hypothesis.

b) Outline the concepts of weak and strong sustainability. Explain various methods of achieving sustainability. Also explain the concept of intergenerational equity in resource allocation. 25+25=50

8. Write in detail the role and functions of the World Bank and IMF. Analyse the effectiveness of these two institutions for the development of the countries. 50

Sl.no.

Pages 2

012

ECONOMICS**PAPER-II****(OPTIONAL)****MARKS : 250****TIME : 3 HOURS**

Answer Question No. 1 which is compulsory and Any Four from the rest.

1. Do you agree with the view that inflation is always a monetary phenomenon? Articulate your justification in line with the existing economic literature on the topic. Briefly explain the various measures that can be used to contain inflation in an open economy. What role can the public distribution system play during inflationary pressure in a developing country like India?

20+20+10=50

2. 'Poverty and inequality in the distribution of income and wealth are the two sides of the same coin' - Substantiate your answer about these two perennial issues of Indian economy with facts and figures. What factors account for the persistence of these problems in Indian society? Mention the various governmental measures introduced over the years in India to wipe out these problems.

20+20+10=50

3. Define national income. Explain the changes that have taken place in the sectoral composition of India's national income since 1951 with adequate data. Is per capita income a better indicator of economic progress in a country?

5+40+5=50

4. Discuss the role played by the small scale and cottage industries in Indian economy. Highlight the main issues that are hindering their growth since the Industrial Policy, 1991?

30+20=50

5. What is green revolution strategy and what are its main thrust areas? Evaluate the role of this strategy in making India a self sufficient country in

[1] [3]

PTO

b) Outline the major components of human resource development. Explain how human development helps in innovation and development. 30+20

5. Critically examine the role of public finance in market economy for stabilization and supply stability. Outline various sources of government revenue and its changes in recent past. Also analyse incidence and effects of various taxes. 20+10+20=50

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b) Outline the concepts of weak and strong sustainability. Explain various methods of achieving sustainability. Also explain the concept of intergenerational equity in resource allocation. 25+25=50

8. Write in detail the role and functions of the World Bank and IMF. Analyse the effectiveness of these two institutions for the development of the countries. 50

SI no.
028EDUCATION
PAPER-I
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

Pages 4

Answer Question No. 8 and Any Four from the rest.

1. A. (i) Define Personality.

(ii) What are the factors influencing Personality ?

(iii) What are the different techniques of measuring Personality ?

(iv) Discuss individual differences and their educational significance.

3+8+8+6=25

B. (i) Explain the meaning and nature of learning .

(ii) What are the factors influencing learning ?

(iii) What is the difference between Classical conditioning and Insightful learning ?

(iv) What do you understand by Transfer of learning ? 10+5+6+4=25

2. A. (i) Define Intelligence.

(ii) Describe the various attributes of Intelligence.

(iii) Discuss the role of heredity and Environment in determining intelligence.

(iv) Describe the Two-factor and Multi-factor theory of Intelligence. 8+5=13
 $3+3+9+10=25$

B. What is educational technology? Discuss the scope and types of educational technology. How can systems approach be applied to instruction? List out its advantages. 8+6+6+5=25

3. A. (i) Discuss the different stages of Growth and Development.

(ii) Why is Adolescence Period described as the period of "Storm and Stress"? Discuss their characteristics, problems and role of Education. 10+15=25

B. (i) Define the terms "Guidance" and "Counselling".

(ii) What are the different types of counselling?

(iii) Why are Guidance services essential in schools and colleges. 5+10+10=25

4. A. (i) Discuss the relationship between Education and Philosophy.

(ii) What are the main tenets of idealism?

(iii) Discuss the methods, and curriculum as according to the Pragmatic Philosophy. 10+5+10=25

B. (i) What do you understand by aims of Education?

(ii) State the difference between individual and social aims of Education.

(iii) Discuss the role of Education in the Development of Human Values. 8+10+7=25

5. A. (i) Discuss the nature and scope of Educational sociology.

(ii) Why do we need a Sociological Approach to Education ?

(iii) Explain "School as a sub-system of the society." $10+7+8=25$

B. (i) What do you understand by "social change" ?

(ii) Explain the reciprocal relationship between Education and social change.

(iii) What do you understand by social groups ? State the difference between Primary and Secondary Groups. $7+8+10=25$

6. A. (i) Discuss the Educational thought and practices in Post-Vedic Period with special reference to the Upanishads.

(ii) State the differences in the Educational Thought and practices of Ancient Rome and Greece. $15+10=25$

B. (i) Explain the relevance of Swami Vivekananda's educational doctrine in the modern day Education.

(ii) Explain the Educational Philosophy of Paulo Freire.

(iii) Explain the need and importance of Distance Education. $10+10+5=25$

7. A. (i) Discuss the concept of Measurement and Evaluation.

(ii) Explain the process and purpose of Evaluation.

(iii) Discuss Bloom's Taxonomy of Educational objectives in the cognitive Domain. $8+7+10=25$

B. (i) What do you mean by measures of dispersion ?

(ii) Explain the various types of measures of dispersion.

(iii) Differentiate between Mean, Median and Mode.

10+10+5=25

8. Write short notes on the following :

10x5=50

a) Cattell's Sixteen Personality factors (16 PF)

b) Concept and characteristics of Normal Probability curve.

c) Concept of Standardized and Teacher-Made Tests

d) Characteristics of a good test

e) Inclusive Education

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Pages 3

010

EDUCATION
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

Answer Question No. 8 and Any Four from the rest.

1. (i) What are the main features of Macaulay's Minute (1835)? What impact they left on Indian Education System? 15

(ii) What are the main recommendations of the Indian Education Commission (1964-66) for the improvement of School Education? 20

(iii) Write important observations of knowledge Commission Report (2007) with reference to higher Education. 15

2. (i) What are the main features of Buddhist Education and how are they different from Brahmanic Education? 10

(ii) What is Wood's Despatch (1854) and why is it so important in the history of education in India? 15

(iii) Describe the concept of National System of Education. What are the recommendations of Programme of Action (POA) with regard to Primary Education. 25

3. (i) What do you mean by Universalization of Elementary Education? Enumerate the role of Sarva Shiksha Abhiyan (SSA) in this regard. 20

(ii) Describe the status of Pre-Primary education in Meghalaya and the initiatives taken by the State Govt. to implement it. 15

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PTO

(iii) What is Rashtriya Madhyamik Shiksha Abhiyan (RMSA) and what are its aims and objectives ? Discuss the initiatives undertaken under RMSA in Meghalaya. 15

4. Describe the aims, roles and functions of

- | | |
|----------|----|
| i) NCERT | 10 |
| ii) CIBE | 10 |
| iii) UGC | 10 |
| iv) NAAC | 10 |
| v) MBOSE | 10 |

5. i) What is Communication ? What are the barriers in Communication ? What measures would you take to enhance the communication process.

5+10+5=20

ii) What is System Approach to Instruction ? How will it be beneficial for effective teaching ? 10+5=15

iii) What are the different types of Educational Technology and how could they be useful in teaching. 15

6. i) What are different levels of teaching ? Explain different levels with example. 10

ii) How is demonstration method different from lecture method ? How is lecture method be more effective combining other methods. 15

iii) a) What are the different types of teacher behaviour. Which behaviour of the teacher is the best. 8+4=12

b) What is team teaching ? How can it be organised and what are its benefits? 4+9=13

7. i) What do you mean by classroom Management ? What are the principles, process and techniques of a good classroom management ? 8+12=20

ii) What is a school plant ? Discuss the planning and design of a school plant.

5+10=15

iii) How is Supervision different from inspection ? Discuss the main features of effective school supervision.

5+10=15

8. Write short notes on the following :

i) Principles of Preparation of school time table and school calendar. 10

ii) Role and functions of DIET, CTE, BRC and CRC. 15

iii) Rural University. 10

iv) Navodaya Vidyalaya - objectives and Quality Concerns. 15

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Pages 4

007

ELECTRICAL ENGINEERING

PAPER-I

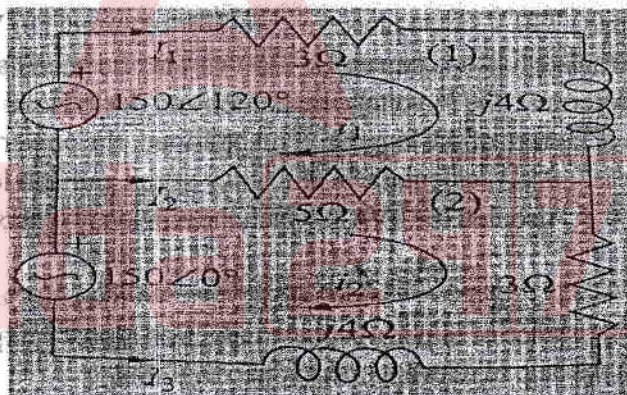
(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

Answer Any Five questions

1. a) Explain maximum power transfer theorem with applications. 8
- b) Prove that the angle between the a.c. voltage applied to a network and the line current supplied to it is equal to the angle of the impedance of the network. 5
- c) The Z-parameters of a circuit are given by $\begin{bmatrix} 4 & 1 \\ 3 & 3 \end{bmatrix}$. Find Y-parameters. 7
- d) Define active filters and classify it. Also explain the working principle of low pass filters. 15
- e) Find I_1 , I_2 and I_3 in the circuit shown below. 15



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2. a) Draw the structure of $n-p-n$ power BJT and explain its operating principle. 15

b) Discuss the series and parallel operation of MOSFET. 15

c) Explain how clipper and clamp circuits can be formed using diodes. 10

d) Elucidation how summing amplifier is different than differential amplifier. 10

3. a) What are the differences between Combinational Circuits and Sequential Circuits? 6

b) Draw RS flipflop circuit and explain its operation with truth table and suggest how to eliminate the undetermined state. 14

c) Discuss the features and functional blocks of FPGA. 15

d) Draw and explain the full adder circuit using half adder. 15

4. a) Draw and explain the Torque-Armature current, Speed-Armature current and Speed-Torque characteristics of DC shunt motor and series motor. 15

b) A 75 KVA, 6600/230 V single phase transformer required 310 V across the primary to circulate full load current on short circuit, the power absorbed being 1.6 kW. Determine the % voltage regulation and the full load terminal voltage for power factors of 0.8 lagging. If on NO-load, the power input to the transformer is 0.9 kW, calculate % efficiency at full and half loads for power factor of 0.8. Also find the kVA at which the efficiency is maximum. 15

c) What is the importance of Slip in a 3-phase induction motor? Explain the phenomena with the help of relevant operational diagrams. 10

d) Explain the conditions that should be met while connecting the alternators in parallel with running alternators. 10

5. a) Draw the V-I characteristics of thyristor and explain different operating regions. 15

b) Explain the operating principle of step-up chopper. 10

c) What are the switching devices used in the inverter circuit? Draw and explain the voltage and current waveforms of the inverter. 15

d) Write a short note on TRIAC. 10

6. a) Why modulation is used in analog communication? What are the sources of noise that affects the communication quality? 10

b) Compare the noise performance of SSB system with that of the DSB-SC system. 15

c) Explain the difference between Klystron and Magnetron tube. 15

d) List out the differences between AM and FM. 10

7. a) Obtain the Fourier coefficient and write the quadrature form of a fully rectified sine wave. 20

b) Determine the Inverse Laplace transform of $\frac{1-2s^2-14s}{s(s+3)(s+4)}$ 10

c) State and prove time shifting property and time reversal property of Z-transform. 20

8. a) What is a travelling wave? Explain the development of such a wave on

- an overhead transmission line. 15
- b) Derive A, B, C, D parameters of a long transmission line in terms of hyperbolic form and expand it using complex exponentials, identities & power series. Also explain the physical interpretation of $(\alpha + j\beta)$. 20
- c) Explain transverse electromagnetic wave. 15

- d) Explain the difference between Klystron and TWT. 15
- e) List out the differences between AM and FM. 10
- f) Obtain the Fourier coefficient and write the quadrature form of a fully rectified sine wave. 20
- g) Determine the inverse Laplace transform of $\frac{s^2 - 1}{(s^2 + 3)(s + 4)}$. 10
- h) State and prove time shifting property and time reversal property of Laplace transform. 10
- i) What is travelling wave? Explain the development of such wave on a transmission line. 10

[4] [1]

SL No.

Pages 4

006

ELECTRICAL ENGINEERING

PAPER-II

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

Answer Any Five questions

1. a) Describe Delay time, Rise time, Peak time, Maximum overshoot and Settling time with relevant diagrams and also obtain their mathematical expression. 15

b) A unity feedback system has open loop transfer function

$G(s) = \frac{1}{s(1+2s)(1+s)}$. Sketch Nyquist plot for the system and therefore obtain the gain and phase margin. 15

c) A feedback system has a transfer function of $G(s)H(s) = \frac{K(1-s)}{s(s^2+5s+9)}$. Using Routh criterion, determine the maximum value of K for the system to be stable. 10

d) Write a short note on PID control action. 10

2. a) Give the classification of magnetic materials in details with properties and applications of each class. 15

b) Define magnetism? Differentiate in between ferromagnetism and ferrimagnetism. 15

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PTO

- c) Explain Piezo-electric phenomenon. 10
- d) Develop the equations to describe the oxidation process. 10
3. a) Draw the architecture diagram of 8085 microprocessor and explain functions of various registers. 15
- b) What are peripheral mapped I/O memory and memory mapped I/O ? Differentiate between them. 10
- c) Explain the implementation of stack in 8085 microprocessor programming. 15
- d) How is silicon nitride used ? Explain its decomposition variables. 10
4. a) Explain the construction and working principle of LVDT. 15
- b) Explain how the inductance is measured in terms of known capacitances using Maxwell's bridge. Derive the conditions for balance. 15
- c) What are the different types of errors ? Explain how to eliminate errors in instruments. 20
5. a) Classify and discuss Power System Stability with examples. Obtain swing equation and develop a condition for calculation of equivalent inertia constant. 15
- b) Why and when the generator bus is treated as load bus ? Point out the drawbacks of GS method over NR method and FLDF method. 15
- c) Explain frequency control mechanism of the power systems. 10
- d) Use decoupled NR method to solve load flow problem for a three bus

system shown below. Each of the three lines has a series impedance of $(0.02 + j0.08)$ p.u. and a total shunt admittance of $j0.02$ p.u. Specified quantities at the buses are tabulated below.

Bus	Real load demand	Reactive load demand	Real power generation	Reactive power generation	Voltage specification
1	2.0	1.0	Unspecified	Unspecified	$V_1 = 1.04 + j0$ (Slack)
2	0.0	0.0	0.5	1.0	Unspecified (PQ bus)
3	1.5	0.6	0.0	$Q_{G3} = ?$	$V_3 = 1.04$ (PV bus)

Reactive power limit for bus 3 is $0 \leq Q_{G3} \leq 1.5$ p.u. Use $\epsilon = 0.01$ for power mismatch. 20

6. a) What is meant by rate of rise of restriking voltage (RRRV) in circuit breaker? Show the steps to calculate RRRV from transient restriking voltage. Mention five important properties of SF6 circuit breaker. 18

b) What is the difference between renewable and new renewables sources? Explain wind energy conversion system with relevant diagram. 12

c) How a PV cell works. Explain with suitable diagram. 10

d) Explain the challenges of exploiting renewables in India and Meghalaya State. 10

7. a) Explain the constructional features and working of Delta modulation. 15

b) Explain the principle of DPSK encoding. 15

c) Elucidate a DPCM system. Derive the expression for slope overload noise of a system. 20

8. a) Explain how range and Doppler measurements are performed using FM CW radar. 15

b) Explain satellite transponder. 10

c) Illustrate the different types of scattering losses in optical fibre. 15

d) Describe the working principle of laser. 10

Sl.no.

Pages 2

018

ENGLISH
PAPER-I
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

Candidates should attempt Question No. 1 and four of the remaining questions, selecting two questions from each section.

1. Write briefly on Any Two of the following : 25x2=50

- a) Mention some of the characteristic features of the English Renaissance by referring to any two literary figures of that time.
- b) Write a note on the contribution of Shakespeare to Elizabethan drama.
- c) What is metaphysical poetry? What role do 'conceits' have in metaphysical poetry?
- d) Why is the Victorian Age considered to be the "age of the novelists"? Who are some of the major novelists of this age?

SECTION-A

Answer Any Two of the following : 50x2=100

2. Discuss King Lear as a typical Shakesperean tragedy.

OR

Critically analyse the plot of The Tempest.

3. "The Rape of the Lock is one of the most lively satiries of the English

[1]

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language." Do you agree? Give reasons for your answer.

OR

Discuss in detail the theme of Milton's *Paradise Lost* with particular reference to Book I and Book II.

4. Bring out the element of melancholy in Tennyson's "In Memoriam" with the help of illustrations from the text.

OR

"In *A Doll's House* Ibsen paints a bleak picture of the sacrificial role held by women of all economic classes in his society". Justify the statement.

SECTION-B

Answer Any Two of the following : 50x2=100

5. Would you agree with the view that in *Tom Jones* Fielding gives more importance to plot than character? Justify your answer.

6. Discuss the appropriateness of the title of Jane Austen's *Pride and Prejudice*.

7. Analyse *Hard Times* as a novel in which Dickens is pre-occupied with social problems.

8. Trace the development of the Huck-Jim relationship in *The Adventures of Huckleberry Finn*.

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Pages 2

ENGLISH
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

Candidates should attempt Question No. 1 which is compulsory, and four of the remaining questions, selecting two questions from each section.

1. Answer Any Two of the following in not more than 250 words each:

25x2=50

- a) Clearly indicate the trends of modern English poetry.
- b) Consider the distinctive features of the Stream of Consciousness Novel.
- c) Write a critical essay on language and style of Indian English poetry.
- d) Write an account of the theatre of the Absurd with a brief reference to one Absurd play.

SECTION-A

- 2. What is the predicament of modern man as reflected in the poetry of Eliot? 50
- 3. Discuss Auden's disillusionment with the contemporary socio-political situation and his response to it as reflected in "September 1, 1939". 50

OR

Philip Larkin's "Next, Please" highlights the folly of expectancy. Do you agree? Give reasons for your answer.

[1]

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4. Examine "Look Back in Anger" as a play of protest against the 'post-war' society. 50

SECTION-B

5. Assess the novel, "Lord Jim" as an exploration of the ideas of fidelity, cowardice and betrayal. 50
6. Lawrence's main interest was always human relationships. Critically examine the truth of this statement with reference to his novel "Sons and Lovers." 50
7. Great as the problem of India is, Forster's book "A Passage to India" is not about India alone; it is about all of human life. Discuss. 50
8. Write a note on the stylistic and technical aspects of the novel "Kanthapura". 50

OR

Critically assess the sense of "exile and alienation" manifested in the study of Naipaul's A House of Mr. Biswas as a post-colonial novel.

Sl. No.

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Pages 6

ENGLISH
(COMPULSORY)
MARKS : 300
TIME : 3 HOURS

The figures indicate full marks for the questions.

Candidates should attempt all questions.

1. Write an essay, in about 500 words, on any one of the following :

150

- a) Democracy in India is a Myth or Reality.
- b) Your views on Capital Punishment as a deterrent to crime
- c) Necessity is the Mother of Invention
- d) A known devil is better than an unknown saint
- e) The Menace of Fake News

2. Read the passage below and answer the questions that follow :

Philosophy of Education is a label applied to the study of the purpose, process, nature and ideals of education. It can be considered a branch of both philosophy and education. Education can be defined as the teaching and learning of specific skills, and the imparting of knowledge, judgement and wisdom, and is something broader than the societal institution of education we often speak of.

Many educationalists consider it a weak and woolly field, too far removed from the practical applications of the real world to be useful. But philosophers dating back to Plato and the Ancient Greeks have given the area much thought and emphasis, and there is little doubt that their work has helped shape the practice of education over the millennia.

Plato is the earliest important educational thinker, and education is an essential element in "The Republic" (his most important work on philosophy

and political theory, written around 360 B.C.). In it, he advocates some rather extreme methods: removing children from their mothers' care and raising them as wards of the state, and differentiating children suitable to the various castes, the highest receiving the most education, so that they could act as guardians of the city and care for the less able. He believed that education should be holistic, including facts, skills, physical discipline, music and art. Plato believed that talent and intelligence are not distributed genetically and thus is to be found in children born to all classes, although his proposed system to selective public education for an educated minority of the population does not really follow a democratic model.

Aristotle considered human nature, habit and reason to be equally important forces to be cultivated in education, the ultimate aim of which should be to produce good and virtuous citizens. He proposed that teachers lead their students systematically, and that repetition be used as a key tool to develop good habits, unlike Socrates' emphasis on questioning his listeners to bring out their own ideas. He emphasized the balancing of the theoretical and practical aspects of subjects taught, among which he explicitly mentions reading, writing, mathematics, music, physical education, literature, history, and a wide range of sciences, as well as play, which he also considered important.

During the Medieval period, the idea of Perennialism was first formulated by St. Thomas Aquinas in his work "De Magistro". Perennialism holds that one should teach those things deemed to be of everlasting importance to all people everywhere, namely principles and reasoning, not just facts (which are apt to change over time), and that one should teach first about people, not machines or techniques. It was originally religious in nature, and it was only much later that a theory of secular Perennialism developed.

During the Renaissance, the French skeptic Michel de Montaigne (1533-1592) was one of the first to critically look at education. Unusually for his time, Montaigne was willing to question the conventional wisdom of the period, calling into question the whole edifice of the educational system, and the implicit assumption that university-educated philosophers were necessarily wiser than uneducated farm workers, for example.

Briefly answer the following questions : 5x5=25

1. What is the difference between the approaches of Socrates and Aristotle?
2. Why do educationists consider philosophy a 'weak and woolly' field?
3. What is meant by the term 'Perennialism' in the context of the given passage?
4. Would you say that Plato's beliefs about education were democratic?
5. Why did Aquinas propose a model of education which did not lay much emphasis on facts?

Choose the correct answer in the context of the given passage: 5x5=25

- (A.i) Education can be defined as the manifestation of the perfection already in man.
- (ii) Education can be defined as the teaching and learning of specific skills, and the imparting of knowledge.
- (B.i) Plato's idea of education was holistic but extreme.
- (ii) Plato believed in child-centric rather than state-centric education.
- (C.i) Plato believed that talent and intelligence are not distributed genetically and thus is to be found in children born to all classes.
- (ii) Plato's model of educational practices is democratic in its approach.
- (D. i) Socrates emphasized on balancing the theoretical and practical aspects of education.

ii) Aristotle emphasized on the importance of paying attention to human nature ; Socrates emphasized upon science.

E. i) Facts do not lead to holistic education.

ii) Facts change with the changing times.

3. Make a precis of the following passage in about one-third of its length and provide a title to your answer. Failure to write within the word-limit may invite deduction of marks. The precis should be written in separate sheet provided for the purpose : 50

India has witnessed great expansion of educational opportunities since the attainment of independence. However, the disabled children have not yet benefited in any substantial manner from the growth in educational facilities. Education of handicapped children ultimately become more dependent and non productive. It is therefore, believed that scarce national resources should not be wasted on them. Further, it has been our misconceived notion that the education of handicapped children requires highly specialized people and as such, it must essentially be very costly. Maybe, precisely for these wrong notions we have not been able to involve clinical and educational specialization programmers of training and education exclusively meant for handicapped children. It is encouraging to note that the new National Policy on Education has recommended the placement of such children in regular schools so as to provide them integrated education along with normal students. The integrated education will take care of the different needs of various categories and types of disabled children. The objective is to place the disabled children in ordinary schools for imparting education with the help of special teachers, aids and other resources. For fulfilling this objective an array of the necessary infrastructure by way of training of teachers, provision of equipment and book etc are some of the basic pre-requisition. Hopefully, the parents and their handicapped children will be greatly relieved when the latter are transferred to regular schools.

4. Rewrite the following sentences after making necessary corrections :

1x10=10

- i) John went out just now.
- ii) The police came after the thief ran away.
- iii) Don't forget switching off the lights before you go out.
- iv) If you don't know the meanings of the word then look in the dictionary.
- v) Never pick up a quarrel with your friends.
- vi) I wasn't feeling very well but the medicine makes me feel better.
- vii) Shall I phone the restaurant for reserving a table ?
- viii) Neither John nor Mary have a hand in this matter.
- ix) He saw a large stain in the carpet which was right in the middle.
- x) Young and inexperienced, the trip sounded easy to me.

5. Insert suitable articles where necessary :

1x5=5

We have _____ swimming pool behind _____ club house. _____ Instructor is _____ honest man. We love _____ smile he always wears.

6. Change the voice of the following :

2x5=10

- i) My first visit to Delhi will always be remembered by me.
- ii) Give the order.

iii) The reason he left the hostel was that his health was suffering.

iv) Polling was postponed at few booths due to the flood.

v) The unarmed protestors were laughed at by the passers-by.

7. Use each of the following words as a noun and as a verb in two separate sentences : $2 \times 5 = 10$

i) Flood

ii) Man

iii) Warrant

iv) Dog

v) Shepherd

8. Give the synonym for each of the following words : $1 \times 5 = 5$

i) Sleep

ii) Kind

iii) Bold

iv) Nourish

v) Big

9. Give the antonym for each of the following words : $1 \times 5 = 5$

i) Gloom

ii) Pleasant

iii) Dull

iv) Average

v) Tame

10. Make meaningful sentences with the following idioms : $1 \times 5 = 5$

i) Apple of discord

ii) By the scruff of the neck

iii) Birds of the same feather

iv) Cold feet

v) Wet blanket

GARO
PAPER-I
(OPTIONAL)
CHUGIMIK MARK : 250
SOMOI ONA : KATTA 3

Singani No.1 ko aganchake, jekoba mingbri (4) aganchakbo.

$$50+50 \times 4 = 250$$

1. Mingsakosan sebo.

(i) Harendra W. Marakni segipa 'Wangala' poedoo mai mai onga obostarangko janapa, tale sebo. Uarango maikai A-chik bebera anirang nangchapa, dokbadale sebo.

$$25+25$$

(ii) 'Sarao Krita' poedoo maina kritaniko agana ? Poedoo pangchake kupebo.

$$50$$

(iii) 'Gongani Kilbolma Supea' poedoo maidakgipa A-chikrangni aganritanganirangko mesoka, poedoo pangchake che-em che-em talatbo.

$$50$$

2. Mingsakosan sebo.

(i) Jonmoni D. Shira 'Mikjumang Agilsak' poedoo maidakgipa agilsakni gimin talata, kupebo. Ua ia poedoo maikai mandena didiani aro mikrakanirangko ona, dokbadale sebo.

$$35+15$$

(ii) Howard Denison W. Momin 'Bilsa Gital' poedoo maidakgipa bilsini gimin agana, poedoo pangchake che-em che-em talatbo.

$$50$$

3. Mingsakosan sebo.

(i) Rhetoric aro Prosodyni gimin talate, uarangni dingtanggrikaniko marate mesokna mesokanirangko onre sebo. 25+25

(ii) Allegory aro Parableni gimin talate, uarangni dingtanggrikaniko mesokna Achikkuo segiminrang dongama ? Dingtalatbo. 10+10+15+15

4. Minggniko seoke, Achikrango ba Achik a'songo ongrongbewal obostarango ba dakrongbewalo pangchake, kupebo : 25+25

(i) Amak gita magape, do-bak gita susite.

(ii) Ampak kancha nangrimja.

(iii) Mana nona manggol, jikna dena ki-gol.

(iv) Me-chik songgabatode, sa'am rimol ra-bite re-na nanga.

5. (i) Mingsani gimin essay sebo.

50

a) Achik jat aro a'songko silroroatani cholrang

(b) Achik magitcha - pagitchamrangni nangipa gunrang

Ba,

(ii) Comprehension :

Chengoni chasongode chakal ringkalgipa Achik manderang antangtangni dongram nokrangko ro-ro'e rikrongachim. Indakgipa nokrangni krongrangni dal-dala bipel mikgittam ba mikbri apala mande sakgittam sakbri dake dongnuna man-pilachim. Uandakgipa nokrangni bolgorang dal-dala aro ro-robeachim. Aganrongani gnan, 'Akongsni cho-dape rika. Chiringsni gabate daka.' Maina chengoni manderangde dal-dala aro bilakachim. Uamangni jakpongarangan da-ororoni mande dal-giparangni ja-ping gita dal-achim. Da-oba

A-chikrangni badiaba mahario skangni manderangni jakpongo gangipa jaksil manggol dongnga. Ua jaksil manggolara da-ororo mande dal'gipani ja'ping sikkroke niode rongrangpila ine agana. Ua salrangode gangguan matchok gita dipblokan do-ga gita ruatan medop kaani keheri gita ong-pila ine aganringani gnang. Uni gimin nokrangba dal'dalna aro rona krabea.

Singa niranugna aganchakbo :

$$5 \times 10 = 50$$

i) Chengoni A-chik nokrangko rikna mai mai bosturangko nanga ?

(ii) 'A-kongsni cho-dape rika. Chiringsni ga'bate daka', ia kattarangni miksonganirangko kubo.

(iii) Ortorangko sebo :

$$5 \times 2 = 10$$

a) bipel, b) mik, c) bolgro, d) keheri, e) medop

iv) Jaksil gangipa A-chikrangni gimin talabo.

v) 'Gangguan matchok gita, dipblokan do-ga gita, ruatan medop kaani keheri gita ong-pila'. Iano toe aganani gimin che-em che-em talatbo.

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Pages 2

GARO
PAPER-II
(OPTIONAL)
CHU-GIMIK MARK : ~~250~~ Present 300
SOMOI ONA : KONTA 3

Singani No.1 na aganchake, jekoba ming 4 ko basee aganchakbo.

1. Karnesh R. Marak maidakgipa janggi tanganiko tangmesokangaha ? Ua baditana A-chikkuo sea jotani barianina on.gilangaha, mesokanirang baksa sebo. 50

Ba

A'chik ma-gitcham pagitchamrangni ripingbagipa ringani minganirang badita rokomrang donga, sulsul sebo. 50

Ba

American Baptist Missionaryrangni sea jotanina on-gilanirang baditana gamchata aro sea jotani a-bani barianina baditana on-gilangaha, sebo. 50

2. Mingsako seoke aganchakbo : 50

a) 'Kim-kingija ka-tongde, mangrakhija gisikde,
Sianiko changgni man'a ka'pong-rangde'.

Ia kattarango sani maidakgipa ka-tongni gimin aro siani gimin aganenga, talate sebo.

b) Sea jotaniara mandeni ba songsami janggi tanganiko janerao gita chacha nikpangpilna dakchaka ine na'a maikai 'Nokdang' dakmesokaniko mesokna mangen, sakkirangko on'e sebo.

3. Mingsako seoke aganchakbo : 50

a) Macbeth an-tangan an-tangna gimaaniko ra-baa ine na'a chanchiama ? Sakkirangko on'e sebo. aganaha ?

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b) 'Dikki-I' o Dikki characterko maikai rika, rongtale sebo.

4. Mingsako seoke aganchakbo :

50

a) Sia bon'ao A-chikrangni dakbewalrangni gimin aro sio bon'o jakkalgipa bosturang aro uarangni mitapgipa donnugimin bimingrangni gimin Mihir N. Sangma maiko agana, rongtale sebo.

b) 'A-song Rim-a' ine aganon maiko miksonga ? A-song Rim-a-ko maikai mania, 'Katta Walim' ki-tapo pangchake rongtale sebo.

5. Mingsako aganchakbo :

50

a) L.M. Holbrookni 'An-chichi Bregimin' ine katta bichongko uni ki-tapna done seaniara baditana golpo baksa melia, sakkirangko on'e sebo.

b) Portia aro Nerisani bak ra'ani 'Veniceni Badinggipa' dakmesokanini chusokgipa onganina baditana maikai ongilaha, sebo.

6. Mingsako aganchakbo :

50

a) 'Gamseng' ki-tapo lcylian R. Marak Balme characterchi maidakgipa A-chik me-chikni gunrangko mesoka, rongtale sebo.

b) 'Metongbolni Gittim' dakmesokanio plotko maikai rika, tale sebo.

7. Mingsako aganchakbo :

50

a) Rangse Master Jengbanni janggi tanganina maidakgipa ongilaniko dakpaaha, che'eme sebo.

b) Moniram R. Marakni segipa 'A-chikni Ma-biding' - o janapani gita A-chikrang Tibet a-songoni re-bamiting somoio maidakgipa obostarango chagrongbaaha ? Che'eme sebo.

Q.No.

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Pages 3

**GENERAL STUDIES-I
PAPER-II
(COMPULSORY)
MARKS : 250
TIME : 3 HOURS**

The figures indicate full marks for the questions.

Instructions :

- i) There are 20 Questions in total. Answer Six questions from Q.Nos.1 to 10 and Eight questions from Q.No.s 11 to 20.
ii) Answer to Q.No.s 1 to 10 should be in 150 words whereas answers to Q.No.s 11 to 20 should be in 200 words.

Answer any Six of the following :

6x15=90

1. Is it true that the uprising of 1857 became crucial in affecting the British policies towards colonial India ? Examine critically . 15
2. Analyse the factors responsible for the Civil Disobedience movement (1930-31). 15
3. How did social legislation in the nineteenth century improve the condition of women in India ? Answer citing suitable examples. 15
4. Discuss the mechanism of Indian Monsoon. 15
5. Give an account of the ethnic diversity of the North Eastern States. 15
6. Discuss the characteristics and the distribution of the major soil types of India. 15
7. Make a comparative study of Tropical Cyclone and Temperate Cyclone. 15

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8. Discuss the geopolitical importance of Indian Ocean area. 15

9. What is sex ratio at birth and what are its implications ? 15

10. Discuss the increasing menace of drug abuse among the youth and suggest measures to counter this social disaster. 15

Answer any Eight of the following :

8x20=160

11. Write short notes in not more than 50 words each on any FOUR of the following :

4x5=20

- a) Sufi Movement
- b) Theosophical Society
- c) Gandhara School of Art
- d) Kiang Nangbah
- e) Vesara Architecture
- f) Williamson A. Sangma

12. Examine the causes of the Russian Revolution of 1917 and indicate its significance in world history. 20

13. Analyse the factors leading to the end of the Cold war and account for the US ascendancy in the world. 20

14. What role did the economic ideas play in the early phase of the British rule in the shaping of land tenure policy of the country ? Analyse citing examples. 20

15. What are the positive and negative impacts of Globalisation upon the social fabric of India ? Discuss giving examples. 20

16. What is the concept of plate tectonics ? How does it help in explaining the

formation of the Himalayas ?

20

17. Write short notes in not more than 50 words each on any FOUR of the following :

4x5=20

- a) Meghalayan Age
- b) 'Gift to Monotheists'
- c) El nino
- d) Sustainable development
- e) Agro-forestry
- f) Atmosphere

18. Discuss the causes and consequences of environmental degradation and highlight the related conservation measures.

20

19. Elucidate the concepts of 'majoritarianism' and 'minoritarianism' in accentuating communal tensions in India. Examine the effects critically.

20

20. Discuss the issue of development-induced displacements in India with examples.

20

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Pages 5

**GENERAL STUDIES-IV
PAPER-V
(COMPULSORY)
MARKS : 250
TIME : 3 HOURS**

The figures in the margin indicate full marks and answer length for the questions.

Answer any five questions from 'SECTION-A' and all the three questions under 'SECTION-B'

SECTION-A

(Answer any Five of the following)

1. "Be the change you want to see in the world". Elaborate this famous quote of Mahatma Gandhi, with your own personal or professional examples. (250 Words). 25
2. Distinguish between Ethics and Values. (250 words). 25
3. Write about any one civil servant or any other person with great leadership qualities who inspired you in your life. Spot the values espoused and followed by him/her in his/her professional life that you would like to emulate in your own career. Elaborate each of those values and how they can help in making our country stronger. (250 words) 25
4. Tolerance and harmony are essential attributes of a modern, civilized society. How do you consider their relevance to the world today, especially India? Explain. (250 words) 25
5. "For the inclusive growth of a nation social values are more important than

- economic values." Examine the view with reason and suitable examples. (250 words) 25
6. Write a reasoned note, with suitable examples, on the use and misuse of 'Public Funds' in our country. (250 words) 25
7. Unpack any five (5) of the following expressions in about 50 words each. 25
- a) Integrity in public service
 - b) Moral responsibility
 - c) Corporate Social Responsibility
 - d) Private morality vs. Public morality
 - e) Environmental Ethics
 - f) The ethics of Job Reservations
 - g) Conflict of Interest
 - h) The problem of slippery slope

SECTION-B

(All Questions are compulsory)

Answer the following :

8. The young Deputy Commissioner, let us call him as D.C. - 'A', had a set of plans for his district. The problem came in the form of the local Minister who wanted him to acquire land that was in the name of his wife, for establishing a District Jail. There were several villages that were willing to give land free of cost, so there was really no need to undertake a costly land acquisition. But if the D.C. 'A' openly rejects the proposal of the Minister, he will be transferred out and he will not be able to implement the development plans he had in mind for the district. So, he decides to play a bureaucratic game of deliberate delays, protracted and often unnecessary correspondence with irrelevant government agencies, and conducting unnecessary surveys; with the

sole aim of subtly delaying the process of land acquisition. Meanwhile he keeps lying to the Minister that things were moving in the 'right' direction and the acquisition process would be completed 'soon'. In the intervening period the D.C. 'A' aggressively pursues all his developmental plans and implements and launches several schemes relating to literacy, youth empowerment, and environment. The Minister sees through the game of the D.C. 'A' nearly two years after. He feels cheated and angry that he was taken for a ride and gets the D.C. 'A' transferred out of the district, much against the public will. Before handing the charge over, the D.C. 'A' writes a long note on the file why the land should not be acquired, marks a copy to the Government, hands over the charge to the successor, and leaves the District. Two successor D.C.s 'B' & 'C' express their helplessness to do the land acquisition to the Minister, quoting the strong note of the D.C. 'A' on the file. The Minister finally gets the land acquisition done three years later, by appointing a very pliable person near the retirement age, as the D.C. 'D', who acquires the land. Money changes hands and the Minister is finally a happy man.

Examine the above case, and analyse what you would do if you were the Deputy Commissioner. What kind of ethical issues are embedded in the above story and how should an ideal civil servant resolve the issue? (500 words) 50

9. A woman was on her deathbed. There was one drug that the doctors thought might save her. It was a form of radium that a pharmaceutical company in the same town had recently discovered. The drug was expensive to make, but the owner of the company was charging ten times what the drug cost him to produce. He paid \$200 for the radium and priced it at \$2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about \$1,000 which is half of what it cost. He told the owner that his wife was dying and asked him to sell it cheaper or let him pay later.

But the druggist said : "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and broke into the man's labora-

tory to steal the drug for his wife.

Analyse the case and explain what would you do if you were in a similar situation? Your answer should be categorical and your reasoning should be clear. (250 words) 25

10. Botswana is a multi-religious country. Some of the staff members and students are Muslims while some are Christians. It is common knowledge that different Christian denominations have different ways of pursuing their religious practices, as evidenced by the fact that people who belong to the Seventh Day Adventist Church go to church on Saturdays. According to them, the Sabbath starts at 6 p.m. on Friday and ends at 6 p.m. on Saturday. During this period, all members are not supposed to do anything that may be viewed or perceived as "work." Members of other churches such as the Methodist church, Anglican etc. on the other hand, go to church on Sundays. As a result of these differences, the University of Botswana was at one stage faced with a difficult task of satisfying the religious interests and liberties of students of the Seventh Day Adventist church without compromising the welfare and the interests of other religious groups.

As a way of ensuring that students are not overburdened with work during the final examination period, a decision was taken by the University that some of the papers should be written on weekends. Students of the Seventh Day Adventist church demanded that they be excused from sitting in the final examinations on Friday evenings and Saturdays because that is the time that they use to worship God. They contended that the university has no right to force them to sit for examinations on their day of worship because the country's constitution gives them the right to worship God as freely as possible. Instead of being forced to comply with the university regulations governing the conduct of final exams, they argued that special exams must be set for them so that they can worship without any hindrance.

When the issue was discussed at the departmental level, some departments

felt that the examination regulations should be enforced without fail. This means that those who fail to attend the exams for any reason should be awarded a zero mark. The argument advanced was that students can make a choice between their academic work and their religious beliefs. Most importantly, some people argued that if students do not sit for the final exams because of their religion, Lecturers will be forced to prepare special exams for them, thus increasing their workload. Other members of staff argued that by failing to accommodate the interests of the affected students, the university will be contravening the country's constitution which gives people the right and freedom to worship. They strongly contended that it will be highly embarrassing for an institution of higher learning to trample upon the fundamental human rights and freedoms of the affected students.

After prolonged discussions and debate, the university management decided that all final exams scheduled for weekends will go ahead as it has always been done. It was explained in clear terms that all students who miss exams for personal or religious reasons will be awarded a zero mark and will have to take the course(s) again. This is because students belonging to other Christian denominations wanted to be accommodated and argued that they should also be exempted from sitting for examinations on Sundays. The Muslim students also contended that no exams should be set for Fridays because that would deny them an opportunity to go to the mosque and pray. Hence, the university management decided that religious beliefs should not be allowed to interfere with the operations of the university.

If you were the University Administrator, what would your decision be in a situation like this? Do you agree with the decision made by the University management? If so, why? If not, why? Discuss the ethical dilemmas that you as an administrator will face under such circumstances given the context of our own country which is also a multi-religious country and has a constitution that lets people preach, practice and profess their respective religions.
(500 words)

50

Sl.no.

Pages 3

038

GEOGRAPHY

PAPER-I

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

The Candidates have to answer Question No. 1 and Any Four from the rest, selecting at least one from each section.

SECTION-A

1. On an outline map of Asia provided to you, mark the location of any ten of the following and write about their respective characteristics / significance in your answer book within 40/50 words each : $(2+3) \times 10 = 50$

- Lake Baikal
- Yellow sea
- Karakoram Range
- Shanghai
- Gobi desert
- Hwang Ho River
- River Euphrates
- Persian Gulf
- Mount Fuji
- Arctic Circle
- Aral sea
- Lahore
- Vietnam

2. What is plate tectonics? What are the different types of plate boundaries and what geological features do they create? Explain the phenomenon of sea

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floor spreading in association with plate movement. $15+20+15=50$

3. Classify world's climate based on Koppen's scheme of classification and discuss each of the major types. What is the basis of Koppen's classification and why is it the most widely used classification? What are the major criticisms of Koppen's classification of world climate? $25+10+5+10=50$

4. Write short notes of any Five from the following : $5 \times 10 = 50$

- Differentiate between Epeirogenic and Orogenic movements
- Differentiate a cold front from that of a warm front
- Heat Budget
- Jet streams
- Differences between terrigenous and pelagic ocean deposits
- Soil Profile
- Social forestry
- Causes of global warming
- Causes of bio diversity loss

SECTION-B

5. Discuss Geography as the study of "Areal differentiation". Explain the concept of determinism and possibilism. Discuss the nature of dichotomy between physical and human Geography. $15+15+20=50$

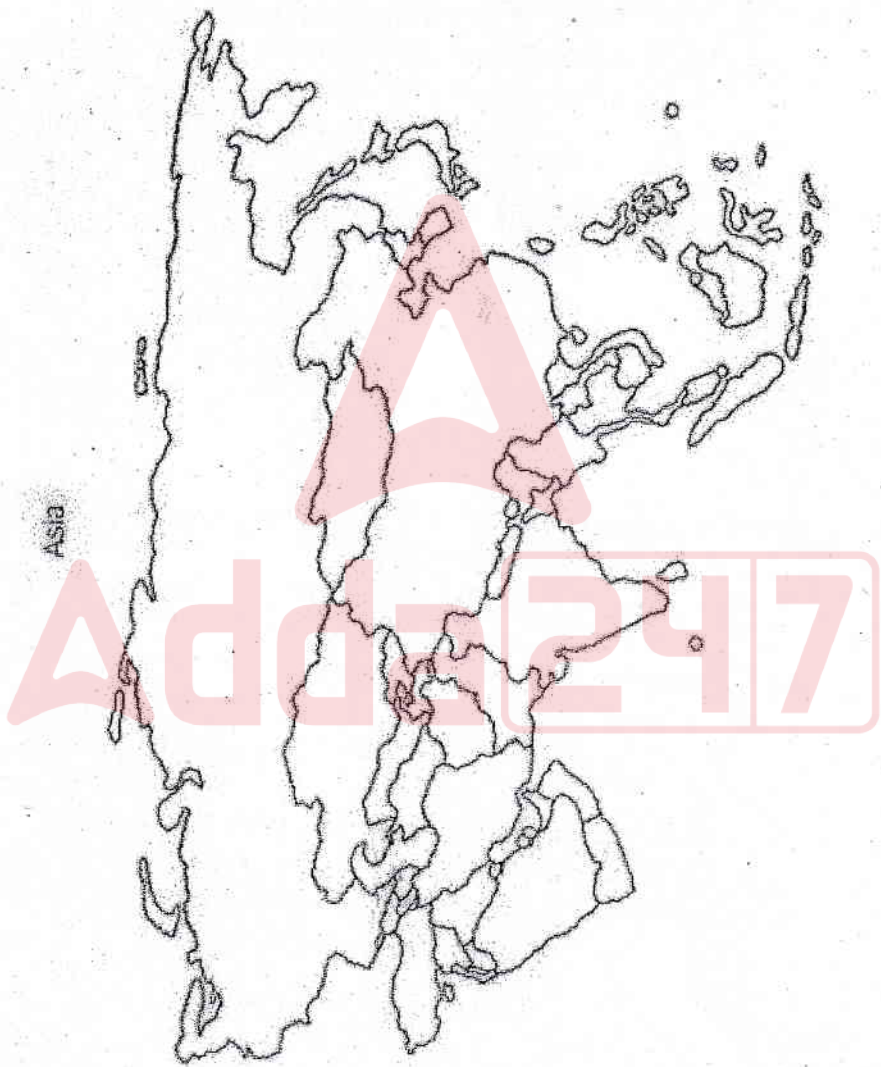
6. Discuss the concepts associated with over-under-and optimum population. Does high density of population necessarily mean over-population? Explain the concept of carrying capacity? $30+10+10=50$

7. What is a central place? Discuss the Central Place Theory as proposed by Walter Christaller to explain the spatial arrangement, size, and number of settlements. Why is the theory not applicable to the real world in most cases? $15+30+15=50$

8. Write short notes on Any Five from the following : 5x10=50

- a) Human Development indicators
- b) Demographic consequences of migration
- c) Energy crisis
- d) Rank Size rule and the concept of Primate City
- e) Rural urban fringe
- f) Types of regions
- g) Rim land theory
- h) Differences between regional diversity and regional disparity





Sl.no.

Pages 3

046

GEOGRAPHY

PAPER-II

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

Question No. 1 is compulsory and
selecting Two questions from each
SECTION-A section

1. On an outline map of India provided to you, mark the location of any ten of the following and write about their respective significance in your answer book within 40/50 words each :

 $(2+3) \times 10 = 50$

- a) Hugli basin
- b) Chilka Lake
- c) Latur
- d) Sriharikota
- e) Wular lake
- f) Bhakra Dam
- g) Tawang
- h) Kandla port
- i) Patkai Bum Range
- j) Kanchipuram
- k) Tungabhadra River
- l) Hubli
- m) Kavaratti
- n) Palni Hills

2. "India's climate is characterised by distinct seasonality" - Discuss the statement by examining the variation in temperature, rainfall and pressure condition prevailing in different seasons. What has been the impact of global climate change in India's climate condition.

 $35+15=50$

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3. Highlight the broad characteristics of Green Revolution. Discuss in detail the socio-economic and ecological implications of Green Revolution on the agricultural scenario of India. What has been the influence of green revolution in the agricultural development of states of India. $10+30+10=50$

4. Write brief notes on Any Five of the following within 200/250 words each: $5 \times 10 = 50$

- a) Drainage system of peninsular plateau
- b) Evolution of the Himalayan Landscape
- c) Groundwater issues and crises
- d) India's trade relation with SAARC/ASEAN countries
- e) Distribution of energy resources in India
- f) Tourism industry and the North East
- g) Railways in north east regions economic development
- h) White revolution
- i) Irrigation network of India
- j) Look East Policy and economic development of North East Region

SECTION-B

5. "Schedule Tribe population of India shows a tendency towards clustering and concentration." Examine the statement in the light of their spatial pattern of distribution in India. Give a brief account on the racial, linguistic and religious diversity of any two tribes of India selecting from two different regions. $20+(10 \times 3)=50$

6. What do you understand by 'urban area'. Provide the census definition of urban areas and how has it changed over the century. Discuss the pattern of urbanisation in India since 1951 and highlight the impact of urbanisation on environmental pollution. $5+15+20+10=50$

7. Evaluate the various plan of the Government of India for development of

hill and tribal areas as well as other backward areas. What is the role of North East Council in the development of North East India? 30+20=50

8. Write brief notes on Any Five of the following within 150/200 words each: 5x10=50

- a) India and geo-politics of Indian ocean
- b) Aging of India's population and its consequences
- c) Issues of River water sharing in India
- d) Sex-Ratio scenario in India
- e) Implication of rural-urban migration in India
- f) Coal mining and Environmental Issues in Meghalaya
- g) Inter-State border dispute
- h) River linking and regional development
- i) Role of language in state formation
- j) India's agrarian crises and remedies

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Pages: 3

GEOLOGY

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

Answer Q1 which is compulsory and any 4(four) question from the rest, selecting at least two from each section.

The figures in the margin indicate full marks for the question.

1. Write short notes on *any five* of the following: 10×5=50

- a) Hydraulic conductivity
- b) Microfossils
- c) Ductile structures
- d) Application of geomorphology in mineral exploration
- e) Boundary problem
- f) Formation
- g) Basic elements of folds
- h) Tectonics

Section-I

2. Write explanatory notes on *any two* of the following : 25×2=50

- a) Island arc
- b) Age of the earth
- c) Discontinuities in the interior of the earth

3. Write short notes on *any five* of the following : 10×5=50

- a) Dendritic drainage pattern

- b) Electro-magnetic spectrum
- c) GPS
- d) Orbiting satellites
- e) GIS
- f) Relationship between morphology and structure
- g) Geomorphic cycle

4. Write short notes on *any five* of the following : 10×5=50

- a) Disconformity
- b) Asymmetric fold
- c) Concept of foliation
- d) Faults in collisional settings
- e) Joints in folded rocks
- f) Front-bearing and back-bearing
- g) Criteria for recognition of faults (list any four)

Section-II

5. Answer *any two* from the following : 25×2=50

- a) Outline the use of microfossils with reference to petroleum exploration
- b) Write a note on the types of Siwalik fauna. What could be the probable cause of their extinction?
- c) Outline the morphology of a typical brachiopod shell with suitable sketches

6. Answer *any two* from the following: 25×2=50

- a) Ranks of lithostratigraphic units
- b) Tertiary succession of Assam-Meghalaya
- c) Precambrian rocks of Karnataka

7. Answer *any two* from the following: 25×2=50

- a) Write a note, with proper sketches, on how rock structures have an effect on the stability of a dam
 - b) Illustrate the engineering properties of rocks
 - c) Explain the feasibility of tunneling in folded rocks with proper sketches
8. Answer *any two* from the following: $25 \times 2 = 50$
- a) State and explain Darcy's Law
 - b) Explain how geological studies help in estimating the groundwater potential of a region
 - c) What are aquifers? Describe the types of aquifers with neat sketches.



Sl.no.

Pages: 2

002

GEOLOGY

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

Answer Q1 which is compulsory and any 4(four) questions from the rest, selecting at least two from each Section.

The figures in the margin indicate full marks for the question.

1. Write short notes on *any five* of the following: $10 \times 5 = 50$

- Distinguish pleochroism from extinction
- Bowen's Reaction series
- Clastic rocks versus non-clastic rocks
- Early magmatic ore deposits
- Geological prospecting
- Types of meteorites
- Importance of wetlands
- Granitization

Section-I

2. Write explanatory notes on *any two* of the following: $25 \times 2 = 50$

- Structural classification of the silicate minerals
- Crystal defects
- Optical properties of the feldspars

3. a) What is magmatic differentiation? List the processes of magmatic differentiation. Explain any one of them. What is assimilation?

 $5+5+10+5=25$

b) Write short notes on *any two* of the following: $12.5 \times 2 = 25$

- Charnockites

- ii. Migmatites
- iii. Deccan volcanic province

4. Write explanatory notes on *any two* of the following : $25 \times 2 = 50$

- a) Sedimentary facies
- b) Diagenesis
- c) Heavy minerals

Section-II

5. Write explanatory notes on *any two* of the following: $25 \times 2 = 50$

- a) Controls on ore localization
- b) Structural petroleum traps
- c) Origin and mode of occurrence of copper ore deposits in India
- 6. a) Write notes on Geochemical prospecting or Seismic Reflection survey 25
- b) Give the genetic classification of hydrothermal deposits 25

7. Answer *any two* from the following: $25 \times 2 = 50$

- a) Environmental impact of opencast mining
- b) Environmental effects of urbanization
- c) Cosmic abundance of elements

8. Write short notes on *any five* of the following $10 \times 5 = 50$

- a) Skarn deposits
- b) Distribution of Cu-Pb-Zn deposits in India
- c) Causes of sea-level rise
- d) Mode of occurrence of coal deposits in Meghalaya
- e) Bulk sampling
- f) Mineral beneficiation
- g) Placer deposits

Sl.no.

Pages 3

251

**GENERAL STUDIES-II
PAPER-III
(COMPULSORY)
MARKS : 250
TIME : 3 HOURS**

The figures in the margin indicate full marks for the questions.

Instructions :

- i) There are 20 Questions in total. Answer Any Six questions from Q.Nos.1 to 10 and Any Eight questions from Q.No.s 11 to 20.
ii) Answers to Q.Nos. 1 to 10 should be in 150 words whereas answers to Q.Nos. 11 to 20 should be in 200 words.

Answer any Six of the following :

6x15=90

1. Has VVPAT helped to maintain the integrity of electronic voting machine in India ? Give reasons for your answers. 15
2. Explain the functions and powers of lieutenant governor in union territories. 15
3. What are the features of Anti Defection Law ? 15
4. How does the concurrent list help to maintain centre- state relationship ? 15
5. Critically examine the functions of Finance Commission. 15
6. To what extent has the implementation of The Right to Information Act enhanced the fight against corruption ? Explain. 15
7. What are the roles of Comptroller and Auditor General in ensuring accountability in India ? Give suitable examples. 15

1-10 = 6 } Total - 14
11-20 = 8 } [1]

PTO

8. Explain Sustainable Development Goals. 15

9. Explain about National Commission for women. Has it been successful in tackling the problems faced by women in all the spheres of their lives? 15

10. Explain the features of "Mission Indradhanush" Scheme. 15

Answer Any Eight of the following :

8x20=160

11. The Northeast plays a key role in India's strategic shift from "Look East" to "Act East". Analyse. 20

12. How does "Swadesh Darshan" Scheme help to promote tourism in India? Write how it can help tourism in Meghalaya as well. 20

13. What is the relevance of autonomous district councils in the changing demography of north east region? Examine critically. 20

14. AFSPA was introduced to meet the security challenges and the management of border areas. Critically analyse the provisions of the Act. 20

15. Write short notes on Any FOUR of the following in not more than 50 words : 4x5=20

- a) Fundamental duties
- b) e-governance
- c) "Niti Aayog"
- d) Central Vigilance Commission
- e) PESA
- f) "Ayushman Bharat Yojana"

16. What is the role of Pressure Groups in the political process of India? Is it true that informal pressure groups have become more powerful than formal

pressure groups in recent years ? Discuss giving examples. 20

17. Explain the separation of powers among legislative, executive and judiciary as enshrined in the Indian Constitution. Do you think that the Supreme Court's power to decide 'Basic Features' of the Constitution is against the separation of powers among the three organs of Government, which in itself is a basic feature of the Constitution ? Critically examine. 20

18. What is the procedure to amend the Indian Constitution and what are the various types of amendments ? Discuss. 20

19. Describe the writ jurisdiction of Supreme Court and High Courts. What is the difference between Public Interest Litigation (PIL) and writ petition? 20

20. Write short notes on Any FOUR of the following topics in not more than 50 words : 4x5=20

- a) International Solar Alliance
- b) National Register of Citizens
- c) Arctic Council
- d) SAARC
- e) "Beti Bachao, Beti Padhao"
- f) Abrogation of Article 370

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Sl. No.

091

Pages 4

GENERAL STUDIES-III
PAPER-IV
(COMPULSORY)
MARKS : 250
TIME : 3 HOURS

The figures in the margin indicate full marks for the questions.

Instructions :

- i) There are 20 Questions in total. Answer Any Six questions from Q.Nos.1 to 10 and Any Eight questions from Q.No.s 11 to 20.
ii) Answers to Q.Nos. 1 to 10 should be in 150 words whereas answers to Q.Nos. 11 to 20 should be in 200 words.

Answer any Six of the following :

6x15=90

1. Discuss the merits and challenges of GST implementation in India. 15
2. What is Inclusive Growth ? Can Poverty and Unemployment be eradicated in India without Inclusive Growth ? Explain. 15
3. Estimate India's progress in Space Science and Technology citing some major examples. 15
4. What are the provisions of The Biological Diversity Act, 2002 ? 15
5. Discuss the importance of expanding the National Highways network for economic growth. 15
6. What are the impacts of social media on national security in changing times? Explain. 15

[1]

PTO

7. What are the major reasons for the survival of armed insurgency in the North-East region of India ? Analyse critically. 15

8. The Border Security Force plays an important role in national security. Elaborate. 15

9. Describe the relevance of "Smart Cities" in urban development of India. Can it widen rural-urban divide ? Discuss. 15

10. Discuss about the tools or the instruments used by the Reserve Bank of India to manage the Monetary Policy of our country. 15

Answer Any Eight of the following :

8x20=160

11. Organic farming helps to make agriculture more productive, sustainable and climate resilient. Detail the steps to be taken by the government to make Meghalaya a fully organic state. 20

12. What are the features of the National Bamboo Mission ? Explain with its special relevance to the North East India. 20

13. Discuss the role of Renewable energy in India's energy security and future climate change policies. 20

14. Write short notes in not more than 50 words each on any FOUR of the following : 4x5=20

- a) Operation Greens
- b) Blue Revolution
- c) Digi Locker
- d) Bank Board Bureau
- e) Angel Tax

a) GHI (Global Hunger Index)

15. What is rat hole mining ? Discuss with suitable examples the human and ecological implications involved. 20

16. Write short notes in not more than 50 words each on any FOUR of the following : 4x5=20

- a) Zero Budgeting
- b) Masala Bonds
- c) Ease of Doing Business
- d) Consumer Price Index
- e) WTO
- f) National Horticultural Mission

17. Define Minimum Support Price (MSP). How does it help the farmers in ensuring that they do not get entrapped into low income due to market uncertainties ? 20

18. Write short notes in not more than 50 words each on any FOUR of the following : 4x5=20

- a) GPS and AGPS
- b) 'SWAYAM'
- c) Nipah virus
- d) OLED
- e) Bitcoin
- f) Nanotechnology

19. Discuss the role of National Disaster Management Authority in disaster prevention, preparedness and mitigation in India. 20

20. Write short notes in not more than 50 words each on any FOUR of the following : 4x5=20

- a) Ramsar Convention
- b) National Tiger Conservation Authority
- c) CITES
- d) Biosphere Reserves with examples
- e) Air Quality Index
- f) Solid Waste Management



035

HISTORY
PAPER-I
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

Candidates should attempt Question No. 1 and 5 which are compulsory and three of the remaining questions, selecting atleast one from each section.

SECTION-A

1. Mark Any Ten of the following places on the map provided and write short descriptive notes on the places marked : 5x10=50

- a) Dholavira
- b) Kalinga
- c) Pataliputra
- d) Indraprastha
- e) Prayag
- f) Sanchi
- g) Kannauj
- h) Devagiri
- i) Badami
- j) Bijapur
- k) Calicut
- l) Panipat
- m) Raigarh
- n) Surat
- o) Madurai
- p) Masulipatam

2. Discuss the beginnings and development of Stone Age cultures in India. 50

3. Write short essays in not more than 300 words each on Any Two of the following : 25x2=50

- a) Early Vedic culture
- b) Teachings of Gautama Buddha
- c) Mauryan administration
- d) Society and economy in the Gupta period
- e) Pallava art and architecture

4. Describe the main features of the Indus Valley civilisation. What was the geographical spread of this civilisation? Enumerate the factors attributed to its decline. 50

SECTION-B

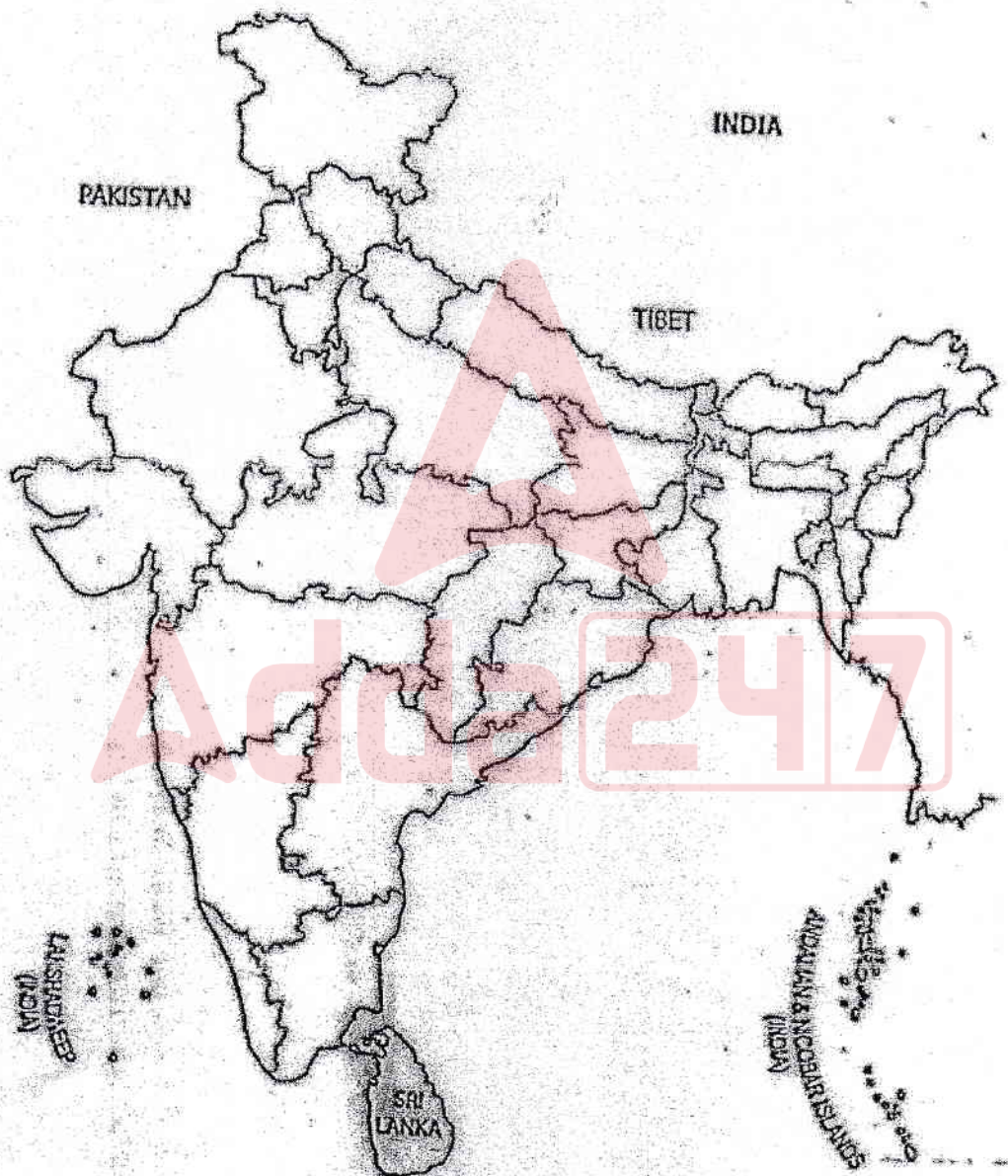
5. Write short essays in not more than 300 words each on Any Two of the following : 25x2=50

- a) Arab invasion of Sind
- b) Early Sultanate art and architecture
- c) The Bhakti movement and its effects on Indian society
- d) Akbar's Rajput policy
- e) Krishnadeva Raya

6. Give an account of the administrative and economic condition of the Ahom state. 50

7. Why was the Mughal period regarded as one marked by remarkable cultural attainments ? 50

8. Discuss the political condition of India in the eighteenth century. 50



018

HISTORY
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Candidates should attempt Question No. 1 and 6 which are compulsory and three of the remaining questions, selecting at least one from each section.

SECTION-A

1. Elucidate Any Two of the following in about 300 words each :

25x2=50

- a) Drain of wealth
- b) Brahmo Samaj
- c) Development of railways in India during the period of British rule
- d) Nature of the Revolt of 1857
- e) The Government of India Act 1919

2. Discuss the land revenue settlements in British India and their economic impact. 50

3. Trace the developments leading to the Civil Disobedience Movement of 1930-31. Highlight the main programmes of this movement. 50

4. Examine critically the important factors responsible for the growth of communalism in India in the early part of the 20th century. 50

5. Describe the process of integration of the princely states with the Union of India. 50

SECTION-B

6. Discuss Any Two of the following in about 300 words each :

25x2=50

- Salient features of the Renaissance
- Causes of the French Revolution
- Industrial Revolution in Britain - causes and effects
- Unification of Germany
- Russian Revolution of 1917

7. Elucidate how the Nazi and Fascist ideologies were responsible for the outbreak of the Second World War. 50

8. Give a brief history of the Non-Aligned Movement and bring out its significance in the Cold War era. 50

9. What is decolonisation ? Discuss the process of decolonisation in Algeria. 50

10. Examine the factors leading to the breakup of USSR 1985-91. 50

Sl.no.

005

Pages: 2

KHASI
PAPER-I
(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Answer Any Five questions by choosing at least one question from each Group

GROUP-A

1. Kaei ka Ballard ? Bishar ia ka dur ka dar jong ka Ballard. Thew bad woh sani ia ka poim *Ka Sohlyngngem* jong u Oscar. M. Wahlang kum ka Ballard.

10+15+25=50

2. Tai bniah haduh katno ka Jylla Synshar Paidbah bad ka Jylla Kaba Lai ha ka poim *Ka Burom Ba La Jah* ka siat pharshi ia ka synshar-khadar bad ia ka longbriew-manbriew ha kane ka juk ba mynta.

25+25=50

3. Batai ia ka dur ka dar jong ka Phawar. Thoh bniah ia ka phang pdeng kiba don ha *Ka phawar Shadwait* bad *Ka Phawar Iasiat Thong*.

10+20+20=50

GROUP-B

4. ".....ka rngiew ka long kawei kaei kaei kaba U Nongbuh Nongthaw u la shon shap lypa ha ka jyrmat jong uwei pa uwei u briew."

Da kaba pynshong nongrim ha katei ka jingong, bishar bniah haduh katno u nongthoh u la lah ban wanrah ia ka bynta jong ka rngiew kum ka pyrkhath khasi ha ka sawangka *Ka Rangli*. Tai sani ruh ia ka bynta jong ki tyngshop-puron kiba u nongthoh u ai ia ka kamram ban pyntyllun ia ka rngiew ha kane ka sawangka.

30+20=50

[1]

PTO

5. Batai bniah haduh katno u H.W. Sten u la lah ban wanrah ia ki Lai tylli ki Jingilang (Three Unities) ha ka sawangka **Ka Mahadei**. 50

6. Bishar sani haduh katno u S.J. Duncan u la lah ban wanrah ia ka sap-kren bad ka biria-rai ha ka sawangka **U Androkis bad U Sing**. 50

GROUP-C

7. Pynshongdor haduh katno u H.W. Sten u la lah ban pyndonkam ia ka jingphoh sniew, jingiohi paw bad ia ka jingiap ha ka nobel **Ka Samla Nongkyndong**. 20+15+15=50

8. Tai bniah bad pynshong dor ia ka bynta jong ka Mariang ha kaba wanrah ia ka thain sohsat, ka law sohsat bad ha kaba py tyllun ia ka khana hi baroh kawei ha ka nobel **Kam Kalbut**. 50

SLno.

Pages2

005

**KHASI
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS**

The figures in the margin indicate full marks for the questions

Answer Any Five questions by choosing at least one question from each group

GROUP-A

1. Da kaba pynshong nongrim na ka kot *Ka Niam Khasi* jong u H. Lyngdoh, thoh bniah ia ka rukom mih ki jait Lyngdoh bad ki jait Syiem ha kane ka Ri jong ngi. Ai de ia ki jingkynthoh jong phi. 20+20+10=50
2. Kaei ka Synjat ? Ai ka jingbatai kaba kham bniah shaphang ka poikha-poiman u Khasi kat kum ka rukom ia pynhiar Synjat. Ai jingkynthoh ia ka bynta u Ksiang ha poikha-poiman u Khasi mynta. 10+25+15=50

GROUP-B

3. Kiei ki Tyngshop-puron ? Batai bniah kumno u H. W. Sten u batai ha kaba iadei bad ki buit thaw Tyngshop-puron ha ka Novel. Batai shai ruh ia ki nongrim kiba u Aristotle u kdew ha kaba ia dei bad ka jingthaw ia u Tyngshop Shempap. 10+20+20=50
4. Kat kum u F.M. Pugh, batai bniah ia ka bynta ka bor ba Maia, ka Rynsan bad ka Khoros kum ki mat ba kongsan ha ka drama. 15+20+15=50

GROUP-C

5. "Ka snem 1960 ka ieng kum u mawmarok uba pyniakhlad ia ka juk shah shrah bad ka juk seisoh." Halor katei ka jingong thoh bniah ia ki kam kiba khraw kiba u R.S. Lyngdoh bad u F.M. Pugh ki la pynnoh ban kyntiew ia ka thoh ka tar khasi ha katei ka pateng. $25+25=50$

6. Ki snem 1910-1920, la niew ruh kum "Ka pateng jong ki lai ngut shipara". Thoh bniah ia ka jingnoh synniang jong kine ki lai ngut shipara ban kyntiew ia ka thoh ka tar Khasi. $20+15+15=50$

GROUP-D

7. Ryngkat bad ki nuksa, thoh bniah halor kine ki jait verb harum :

$20+15+15=50$

- a) Transitive verb
- b) Causative verb
- k) Reciprocal verb

8. Batai shai kumno ka shim kylliang kyntien ka long kawei na ki lad ban pynriewspah ia ka ktien. Ai hynniew tylli ki nuksa ban pyni kumno ka ktien khasi ka shim kylliang na ka ktien Indo-Aryan ha ka : $8+14+14+14=50$

- a) Ka bishar
- b) Ka bam ka dih
- c) Ka synshar ka khadar

Sl.no.

Pages: 2

006

LAW

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The question are of equal value.

Candidates should answer Question Nos. 1 and 5 which are compulsory, and any three of the remaining questions, selecting at least one from each Section.

Section -A

1. Answer *any two* of the following (each answer should not exceed 200 words) : 25 x 2 = 50
 - a) Prima facie the expression 'equality before law' and 'equal protection of law' may seem to be identical. Explain the concept of equality and equal protection of laws in its proper spectrum.
 - b) Describe the role of judiciary in harmonizing the Fundamental Rights and the Directive Principles of State Policy.
 - c) What are the general features of the Amending Procedure prescribed by the Constitution of India.
 - d) Explain the powers, privileges of the Houses of Parliament guaranteed under the provisions of the Constitution of India.
2.
 - a) Explain the application of the 'Doctrine of Waiver' to the provisions of law contained in Part III of the Constitution. 25
 - b) Explain the application of the 'Doctrine of Pith and Substance' to the provisions of law as contained in the various provisions of the Constitution of India. 25
3.
 - a) Explain with examples the reasonable restrictions enshrined under Article 19 of the Constitution of India. 25
 - b) Does the right to live with dignity also include right to die? Explain with the help of case laws. 25

4. a) Right to property is a human right as also a constitutional right but it is not a fundamental right. Explain with examples 25
b) Differentiate between Article 32 and Article 226 of the Constitution of India. 25

Section-B

5. Write on *any two* of the following (each answer should not exceed 200 words) 25 x 2 = 50
a) United Nations Commission on International Trade Laws
b) Asylum
c) Differentiate between Treaty, Convention, Declaration and Resolution
d) Fundamental principles of International Humanitarian Law
6. Explain the process of adoption of an international document by the United Nations. What is the binding effect of such document on the member states? When does it become obligatory on the part of India as a member state to follow the international documents adopted by United Nations? Explain with the help of relevant provisions of law as well as case laws. 10+10+15+15=50
7. What are the principal organs of the United Nations? Explain. 50
8. a) Discuss the various methods in which international disputes can be settled with reference to decided cases or current affairs. 25
b) What are the basic differences between terrorism perpetrated by non-state actors and terrorism sponsored by States? Explain with examples. 25

Sl.no.

Pages: 2

007

LAW
PAPER-II
(OPTIONAL)

Full Marks – 250

Time – 3 hours

The question are of equal value.

Candidates should answer Question Nos. 1 and 5 which are compulsory, and any three of the remaining questions, selecting at least one from each Section.

Section -A

1. Write short notes on *any two* of the following in about 200 words each: 2×25=50
 - a) Write the definition of criminal conspiracy citing recent Supreme Court Judgments.
 - b) Differentiate between wrongful restraint and wrongful confinement.
 - c) Explain when culpable homicide is not a murder.
 - d) Criminal breach of trust.
2.
 - a) Explain the defence of 'Act of God' in law of torts. 25
 - b) Distinguish between exemplary damage and contingent damage. 25
3.
 - a) What are the maxims of legal damage? Explain 25
 - b) Distinguish between trespass and conversion in tort. 25
4.
 - a) Explain the meaning of 'liability' and discuss the true nature of criminal liability with suitable examples. 25
 - b) Explain the concepts of 'malice in fact' and 'malice in law' with the help of case laws. 25

Section-B

2×2 =50

5. Write short notes on *any two* of the following in about 200 words:
- a) Difference between 'void' and 'voidable' contracts.
 - b) Difference between 'indemnity' and 'guarantee'
 - c) Difference between 'Copyright', 'Trademark' and 'Patent'
 - d) Partnership and Co-ownership
6. a) Define encryption and explain the technical aspects of encryption of a computer. 20
- b) Give a brief account of the role of Public Interest Litigation in Environmental Protection. 30
7. a) What do you mean by Arbitration Agreement and what are the requirements to constitute arbitration agreement? 10
- b) Whether an arbitral award can be challenged before any court of law? If yes, then explain the procedure thereof with case laws. 20
- c) What are the salient features of Right to Information Act, 2005? 20
8. a) Discuss the factors vitiating consent under the law of Contracts 25
- b) Explain the various contracts created through the operation of the law under the Indian Contract Act, 1872. 25

Sl.no.

Pages: 3

013

MANAGEMENT

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figure in the margin indicate full marks for the questions.

Candidates should answer Question Nos. 1 and 5 which are compulsory and any three of the remaining question selecting at least one from each section.

Section -A

1. Answer *any two* of the following questions (answer should not exceed 300 words) 25×2=50
 - a) Distinguish the concepts of Management and Leadership with examples
 - b) How can understanding group behavior and dynamics lead to conflict management?
 - c) Discuss Management Role and innovation in Organizational Design
2.
 - a) Explain the significance of Abraham Maslow's theory of "Hierarch of Needs" in the context of Managerial Motivation 25
 - b) "Effective management of emotions is more important than technological Management" Do you agree? / disagree? 25
3. a) Aircool sells newly branded silent fans to businesses and educational institutions all over India. Mr. Sajit was recently promoted to the positional of National Head, Sales. He has to select a random sample of 10 representatives and determine the number of sales calls each representative made last month and the number of fans sold. The data is presented below:

Sales Representative	Number of Sales Calls	Number of Equipments Sold
T. K	20	30
P. J	40	60
J. M	20	40
P. C	30	60
M. C	10	30
H. B	10	40
E. T	20	40
K. H	20	50
C. N	20	30
S. R	30	70

Calculate the Correlation Coefficient and make suitable inferences to assist Mr. Sajit 25

b) Differentiate between Binomial and Normal Distributions. 25

4. a) What are the various Classical Leadership Styles? 20

b) Which is the preferred style of leadership in a growing organization today? 30

Section-B

5. a) What is the significance of Budget? What is the importance of Balance Sheet in budgeting for the future? 20

b) Explain (*Any Three of*) the following concepts: $3 \times 10 = 30$

- Overhead Cost and Control
- Core Competency
- Management By Objectives
- Balanced Score Card

6. a) What are the major economic issues faced by Indian Economy due to the 2016 Demonetization? 20

- b) How has demonetization affect employment and industry growth? 30
7. a) Evaluate the role of WTO in international trade. 25
- b) How can India have a louder voice in the world trade regime? 25
8. a) What is Activity Based Costing and what are the steps in designing it? 25
- b) Explain the different types of Variances? 25



Sl.no.

Pages: 2

011

MANAGEMENT

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figure in the margin indicate full marks for the questions.

Candidates should answer Question Nos. 1 and 5 which are compulsory and any three of the remaining questions selecting at least one from each section.

Section -A

1. Discuss the efficient portfolio. What is the risk and return of a portfolio? 20+30=50
2. The following information is available in two securities A and B:

	A	B
Expected Return	10%	12%
Standard Deviation	15%	10%
Correlation Coefficient with the market	0.6	0.4
Beta	0.7	0.8

Which of the two securities is more risky? Justify your answer 50

3. While stating the necessity of product differentiation, explain the various differentiation tools that can be utilized. 50

4. Briefly discuss the factors influencing the international business environment. How do the present China and the US trade war affect international trade practices? 30+20=50

Section-B

5. What is the rationale between make or buy decisions? Briefly describe the different stages of a high impact make or buy decision? 20+30=50
6. Explain how codification of materials helps in controlling inventory and subsequent reduction of costs. Also Briefly explain the concept of selective control in material management 20+30=50
7. Discuss the role of various trends information technology that led to its accelerated growth in recent times. 50
8. What is the necessity of training of employees in organisations? Discuss at least five methods used for training new employees within an organization. 20+30=50

002

MATHEMATICS
PAPER-I
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

Pages 5

The figures in the margin indicate full marks for the questions

Answer question 1 and Four questions, selecting Two from each Section.

Assume suitable data if considered necessary and indicate the same clearly.

1. Answer Any Five of the following :

10x5=50

- a) Let V be a vector space over a field F . Let $a \in F$ and $v \in V$. Show that $(-a)v = -(av)$ and $a(-v) = -(av)$.
- b) Show that every differentiable function $f: \mathbb{R} \rightarrow \mathbb{R}$ is continuous.
- c) Find the product of the perpendiculars from (p, q) to the lines represented by $ax^2 + 2hxy + by^2 = 0$.
- d) Find the differential equation of the family of curves
 $y = e^x(A \cos x + B \sin x)$,
Where A and B are arbitrary constants.
- e) From a balloon ascending with a velocity of 10 m/s, a stone is let fall and reaches the ground in 10 second. At what height was the balloon when the stone was dropped?
- f) Show that the work done in drawing a body up a smooth inclined plane is

[11]

PTO

equal to the work done in lifting the body through the height of the plane.

g) Show that $v \times (w \times z) + w \times (z \times v) + z \times (v \times w) = 0$ for any vectors v, w, z .

SECTION-A

2. a) If the dimension of a vector space V is n , then show that any set of $n+1$ vectors in V is linearly dependent. 10

b) Show that any two similar matrices have the same eigen values. 10

c) Let B be a symmetric bilinear form on a vector space V over a field R . Show that there exists an orthogonal basis of V relative to B . 15

d) State and prove Cayley-Hamilton theorem. 15

3. a) Show that the function $f: R \rightarrow R$ defined by $f(x) = |x|^3$ is differentiable. 10

b) Let $f: (3, \infty) \rightarrow R$ be a differentiable function such that $f'(x) = 0$ for all $x \in (3, \infty)$. Show that f is a constant function. 10

c) Let $f: R^2 \rightarrow R$ is defined by

$$f(x, y) = \begin{cases} \frac{xy}{x^2 + y^2} & \text{when } (x, y) \neq (0, 0) \\ 0 & \text{when } (x, y) = (0, 0) \end{cases}$$

Discuss the existence of the limit of f at $(0, 0)$. 15

d) Find the area bounded by one arch of the cycloid $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ and the z -axis. 15

4. a) If W_1 and W_2 are two subspaces of a finite dimensional vector space V , then show that $\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim(W_1 \cap W_2)$. 15

b) Find the volume of the solid generated by revolving the cardioid $r = a(1 - \cos \theta)$. 10

c) Find the maximal and minimal values of the function 15

$$\cos x \cos\left(x - \frac{\pi}{6}\right) \cos\left(x + \frac{\pi}{6}\right), \text{ where } 0 \leq x \leq \pi$$

d) Evaluate

$$\int_0^1 \frac{dx}{\sqrt{1-x^2}}, \text{ if it converges. } 10$$

5. a) Find the equation of the plane passing through the point $(1, 2, 3)$, and perpendicular to the planes $2x + 3y - 4z = 9$ and $x + 2y + 2z = 5$. 10

b) Find the equation of sphere which passes through the circle $x^2 + y^2 + z^2 = 4, z = 0$ and is cut by the plane $x + 2y + 2z = 0$ in a circle of radius 3. 15

c) Find the equation of the cone whose vertex is the origin and which passes through the curve of intersection of $4x^2 - 5y^2 - 7z^2 = 2, 3x - 2y + 4z = 3$. 15

d) Find the nature of the following surface given by the equation $4x^2 + 6y^2 - 16x + 12y - 24z + 22 = 0$. 10

SECTION-B

6. a) Solve $\frac{dy}{dx} = \frac{4x+6y+5}{3y+2x+4}$. 10

b) Solve $\frac{d^2y}{dx^2} + a^2y = \tan ax$, where a is a constant. 10

c) Solve $\frac{d^2y}{dx^2} - \left(2 - \frac{1}{x}\right)\frac{dy}{dx} + \left(1 - \frac{1}{x}\right)y = 0$. 15

d) Apply the method of variation of parameters to solve $\frac{d^2y}{dx^2} + n^2y = \sec nx$. 15

7. a) A particle moving with S.H.M. in a straight line has velocities v_1, v_2 at distances x_1, x_2 from the centre of its path. Show that if T be the period of its

motion, $T = 2\pi \sqrt{\frac{x_1^2 - x_2^2}{v_2^2 - v_1^2}}$. 15

b) A body of weight 4 lb rests in limiting equilibrium on an inclined plane whose slope is 30° . Find the coefficient of friction and normal friction. 15

c) A triangle is immersed in a homogeneous liquid. Show that the sum of the pressure at the vertices is three times the pressure at the centre of the triangle. 10

d) A particle projected from a point O so as to pass through two given points in the same vertical plane with O , at heights h_1 and h_2 above O , and at horizontal distances d_1 and d_2 from it on the same side. Find the angle of projec-

10

Q. 2) Verify Stokes' theorem for $F = y\mathbf{i} + z\mathbf{j} + x\mathbf{k}$, where S is the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ and Γ is its boundary. 20

b) For the twisted cubic $x = 2t, y = t^2, z = \frac{1}{3}t^3$; find $\mathbf{t}, \mathbf{n}, \mathbf{b}, \mathbf{K}, T$. 15

c) Show that the derivative of the product fu of a scalar function f and a vector function u , both being derivable functions of the scalar variable, t , is

given by $\frac{d}{dt}(fu) = f \frac{du}{dt} + \frac{df}{dt}u$. 15

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Pages 5

MATHEMATICS

PAPER-II

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Answer question 1 and Four questions, selecting Two from each Section.

Assume suitable data if considered necessary and indicate the same clearly.

1. Answer Any Five of the following :

10x5=50

a) If G is a group such that $a^2 = e$ for every $a \in G$, show that G is abelian.

b) Show that every convergent sequence in $\mathbb{R}$ is a Cauchy sequence.

c) Show that the function $f: \mathbb{C} \rightarrow \mathbb{C}$ defined by $f(z) = \bar{z}$ is not analytic on $\mathbb{C}$.

d) Find all the basic solutions of the system

$$-2x_1 + x_2 + 3x_3 = 8$$

$$2x_1 + 3x_2 + 4x_3 = 4$$

e) Find the partial differential equation by eliminating a and b from $z = (x^2 + a)(y^2 + b)$.

f) Compute on positive root of $2x - 3 \sin x - 5 = 0$, by the bisection method, correct to three significant decimal places.

g) Define the terms : Generalised co-ordinates, Degree of freedom, Holonomic

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and Non-holonomic systems.

SECTION-A

2. a) Let G be a group ; H and K subgroups of G such that K is normal in G .

Show that $H \cap K$ is normal in H and the quotient group $\frac{H}{H \cap K}$ is isomorphic to the quotient group $\frac{HK}{K}$. 15

b) Show that a group G of order 42 can not be simple. 10

c) Show that every field has exactly to ideals. 10

d) Show that the ring $\mathbb{Z}$, the set of integers, is principal ideal domain. 15

3. a) Show that the function $f: [-1, 7] \rightarrow \mathbb{R}$ defined by

$$f(x) = \begin{cases} 3 & \text{if } x \text{ is rational} \\ -3 & \text{if } x \text{ is irrational} \end{cases}$$

is not Riemann integrable whereas $|f|$, the modulus of f , is Riemann integrable. 10

b) If $f: [a, b] \rightarrow \mathbb{R}$ is continuous, then show that f is uniformly continuous. 15

c) Show that the sequence $\{f_n\}$ where $f_n(x) = x^n$ is uniformly convergent in $[0, k]$ where k is a positive real number less than 1. (5 + 15)

d) If $f: \mathbb{R}^2 \rightarrow \mathbb{R}$ is defined by

$$f(x, y) = \begin{cases} \frac{x^2 y}{x^2 + y^2} & \text{when } (x, y) \neq (0, 0) \\ 0 & \text{when } (x, y) = (0, 0) \end{cases}$$

then show that f possesses partial derivatives $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ at $(0, 0)$. Is f continuous at $(0, 0)$. Justify your answer. 10

4. a) Find the radius of convergence of the power series $\sum_{n=1}^{\infty} n! z^n$. 10

b) Expand $f(z) = \frac{2z^3 + 1}{z^2 + z}$ as a Taylor's series about $z = i$. 10

c) Use method of contour integration to prove that

$$\int_0^{2\pi} \frac{d\theta}{1 + a^2 - 2a \cos \theta} = \frac{2\pi}{1 - a^2}, \text{ where, } 0 < a < 1. \quad 15$$

d) Show that the transformation $w = \frac{z-i}{z+i}$ transforms the unit disc $|w| \leq 1$ into the upper half plane $\text{Im}(z) \geq 0$. 15

5. a) Use simplex method to solve the following linear programming problem:

Minimize $z = 4x_1 + 7x_2$ subject to the constraints :

$$2x_1 + x_2 \leq 1000$$

$$10x_1 + 10x_2 \leq 6000$$

$$2x_1 + 4x_2 \leq 2000$$

$$x_1 \geq 0, x_2 \geq 0.$$

20

b) Find the dual of

Maximize $z = x_1 + 3x_2$ subject to the constraints :

$$x_1 - x_2 \leq 4$$

$$2x_1 + x_2 \leq 14$$

$$2x_1 + 3x_2 \leq 22$$

$$-3x_1 + 2x_2 \leq 6$$

$$x_1 \geq 0, x_2 \geq 0.$$

10

c) Solve the following transportation problem :

20

		Destinations				
		A	B	C	D	
Sources	I	5	3	6	2	19
	II	4	7	9	1	37
	III	3	4	7	5	34
Requirement		16	18	31	25	
						Availability

SECTION-B

6. a) Solve the system of equations, by Gaussian elimination method. 15

$$x + 3y + 2z = 5$$

$$2x - y + z = -1$$

$$x + 2y + 3z = 2$$

b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using Simpson's one third rule for $n=6$. 10

c) Multiply the following numbers and give the answer in base 6 : 15

$$(2134)_2 \times (4172)_8$$

d) Let B is a Boolean algebra and $x, y \in B$. Show that $x + y = y$ if and only

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if $x, y = x$. 10

7. a) Solve $z(z^2 + xy)(px - qy) = x^4$. 10

b) Find a complete, singular and general integrals of $(p^2 + q^2)y = qz$. 15

c) Solve $r + s - 6t = y \cos x$. 10

d) Show that the equation $\frac{\partial^2 z}{\partial x^2} = \frac{1}{k} \frac{\partial z}{\partial t}$ possesses solutions of the form 15

$$\sum_{n=0}^{\infty} c_n \cos(nx + \epsilon_n) e^{-kx^2}$$

8. a) A bead, of mass M , slides on a smooth fixed wire, whose inclination to the vertical is α , and has hinged to it a rod, of mass m and length $2l$, which can move freely in the vertical plane through the wire. If the system starts from rest with the rod hanging vertically, show that $\{4M + m(1 + 3\cos^2 \theta)\} \dot{\theta}^2 = 6(M + m)g \sin \alpha (\sin \theta - \sin \alpha)$, where θ is the angle between the rod and the lower part of the wire. 15

b) Use Hamilton's equation to find the equation of motion of a projectile in space. 10

c) Find the stream lines and paths of the particles for the two dimensional velocity field $u = \frac{x}{1+t}, v = y, w = 0$. 10

d) A mass of fluid is in motion so that lines of motion lie on the surface of coaxial cylinders; show that the equation of continuity is

$$\frac{\partial p}{\partial t} + \frac{1}{r} \frac{\partial}{\partial \theta} (\rho v_\theta) + \frac{\partial}{\partial z} (\rho v_z) = 0,$$

where v_θ, v_z are velocities perpendicular and parallel to z .

15



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002

Pages. 2

MECHANICAL ENGINEERING

PAPER-I

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Answer any Five questions including compulsory Question No.1
Normal Scientific Calculator is allowed

Assume suitable data, if necessary and indicate them clearly

1. A cam that is designed for cycloidal motion drives a flat-faced follower. During the rise, the follower displaces 1 inch in 180° of cam rotation. If the cam angular velocity is constant at 100 rpm, determine the displacement, velocity and acceleration of the follower at a cam angle of 60° .

50

2. A copper rod 25 mm in diameter is encased in a steel tube 30 mm internal diameter and 35 mm external diameter. The ends are rigidly attached. The composite bar is 500 mm long and is subjected to an axial pull of 30 kN. Find the stresses induced in the rod and the tube. Take E for steel as $2 \times 10^5 \text{ N/mm}^2$ and E for copper as $1 \times 10^5 \text{ N/mm}^2$.

50

3. Describe induction hardening process and give its merits and demerits over the flame hardening process.

50

4. Compare the tool life of two cutting tools (HSS and carbide) at a speed of 30 m/min. The tool life is 130 min. The tool life equation for HSS tool is given by $VT^{1/7} = C_1$ and for carbide $VT^{1/5} = C_2$ at a cutting speed of 24 m/min. 50

5. Write down the objectives of implementing total productive maintenance. Discuss about the core elements of TPM program. Compare TQM and TPM. 50
6. State the fundamental law of gearing. Prove this law by considering and neatly sketching two moving curved surfaces in contact. 50
7. A close coiled helical spring is to carry a load of 100 N and the mean coil diameter is to be 8 times that of the wire diameter. Calculate these diameters, if the maximum stress is to be 10 N/mm^2 . 50
8. With the help of a neat sketch explain the working principle of injection moulding. 50

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MECHANICAL ENGINEERING

PAPER-II

(OPTIONAL)

MARKS : 250

TIME : 3 HOURS

Pages 3

The figures in the margin indicate full marks for the questions

Answer any Five questions including compulsory Question No.1

Normal Scientific Calculator, Steam Table with Mollier Diagram are allowed

Assume suitable data, if necessary and indicate them clearly

1. Water is being heated in a closed pan on top of a range while being stirred by a paddle wheel. During the process, 30 kJ of heat is transferred to the water, and 5 kJ of heat is lost to the surrounding air. The paddle-wheel work amounts to 500 Nm. Determine the final energy of the system if its initial energy is 10 kJ. 50
2. Air expands through a turbine from 500 kPa, 520°C to 100 kPa, 300°C. During expansion 10 kJ/kg of heat is lost to the surrounding which is at 98 kPa, 20°C. Neglecting the K.E. and P.E. changes, determine per kg of air the decrease in availability. 50
3. A single-cylinder four-stroke gas engine has a bore of 180 mm and stroke of 340 mm and is governed on hit and miss principle. When running at 400 rpm at full load, indicators cards are taken which give a working loop mean effective pressure of 6.4 bar, and a pumping loop mean effective pressure of 0.36 bar. Diagrams from the dead cycle give a mean effective pressure of 0.64 bar. The engine was run light at the same speed (i.e. with no load), and a mechanical counter recorded 46 firing strokes per minute. Calculate full

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load brake power and mechanical efficiency of the engine. 500 50

4. a) How can you define a thermodynamic property? Classify thermodynamic properties with examples. Define point function and path function. What is a 'State', a 'Process' and a 'Cycle'? 20

b) Derive entropy from absolute thermodynamic temperature scale. 15

c) Through the availability balance of a closed system show that the availability always destroys by all natural processes. 15

5. a) Compare Otto, Diesel and Dual cycles with P-V diagram, T-S diagram and thermal efficiency for 20

- (i) Same compression ratio and same heat rejection
- (ii) Same maximum temperature and pressure

b) Define Brake Specific Fuel Consumption, Mean Effective Pressure and Mean Piston Speed with all necessary relations. 10

c) Compare four stroke and two stroke engines. 10

d) Draw the 'Carburation Curve' and discuss all the ranges. 10

6. a) Write five disadvantages of modern carburetor. 10

b) Discuss Multipoint Fuel Injection (MPFI) System with a neat sketch. 10

c) Discuss different types of losses of energy in IC Engine. 10

d) With neat sketches discuss different types of liquid cooling systems of an automobile IC Engine. 20

7. a) With a neat sketch discuss the working principle of a vapor absorption

refrigeration system. 15

b) Write the eight fundamental psychrometric processes and locate them in a psychrometric chart. 15

c) With neat sketch and mathematical equation show the changes in psychrometric properties, when two airstreams with different thermodynamic conditions are mixed. 10

d) With a schematic diagram, discuss the working principle of a Cascade refrigeration system. 10

8. a) With P-V, T-S and schematic diagrams show how a Rankine cycle is used in a steam turbine power plant. Discuss the working principle with all the processes. 20

b) Why a condenser is needed in a steam turbine power plant? 10

c) Why regeneration is used in steam turbine power plant? With P-V, T-S and schematic diagrams, discuss the working principle of a regenerative steam turbine power plant with two open feedwater heaters. 20

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004

Pages: 2

MEDICAL SCIENCE

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the question.

Answer any five questions.

1. Describe the embryological development of the kidney. Describe the functional anatomy of kidney. Briefly describe role of kidney in the Pathophysiology of Hypertension. 20+15+15=50
2. Describe the principal connections of the basal ganglia. Enumerate the functions of the basal ganglia and the effect of the basal ganglia in humans. 25+15+10=50
3. Describe the cross sectional anatomy of the body at level of the diaphragm and the structures passing through or around it. Describe the types of diaphragmatic hernias. 25+15+10=50
4. Describe the steps of polymerase Chain Reaction (PCR). Describe the advantages of PCR and its applications. 25+10+15=50
5. What is the Genetic Code in protein synthesis? What are the characteristics of the Genetic Code? Describe the components and steps in protein synthesis. 10+10+30=50

6. Describe the pathogenesis of Rheumatic Heart Disease. What are the characteristic gross and microscopic findings on histopathology of the disease. Discuss the drugs for secondary prophylaxis of rheumatic fever. 25+15+10=50
7. Discuss the opportunistic infections and malignancies associated with HIV infection. Discuss the antifungal agents used for the treatment of opportunistic systemic fungal infections. 25+25=50
8. Discuss in detail the injuries caused by a blunt weapon. Write short notes on *any two* of the following: 20+2×15=50
- Factors influencing the nature and extent of wounds.
 - Incised wound vs. Lacerated wound
 - Antemortem vs. Postmortem wound
 - Characteristics of a stab wound.

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Pages: 2

003

MEDICAL SCIENCE

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the question.

Answer any five questions.

1. Describe the causative organism and mode of transmission of Typhoid fever. Describe briefly the clinical features, laboratory diagnosis and management of a case of Typhoid Fever.
10+15+10+15=50
2. Define Nephrotic Syndrome and enumerate its causes. Describe briefly the clinical features, diagnosis and management of Nephrotic Syndrome. What are the complications of Nephrotic Syndrome?
15+30+5=50
3. Enumerate the common causes along with the salient features of cervical lymphadenopathy in the paediatric age group. How will you approach to diagnose and manage a case of cervical lymphadenopathy in a 11 year old child.
20+30=50
4. Write briefly on:
a) Protein Energy Malnutrition
b) Age determination in medico-legal cases
25×2=50

5. What are vector-borne diseases? Enumerate some common vector borne diseases prevalent in India. Describe the steps to be taken to prevent the spread vector-borne diseases. $10+10+30=50$
6. Describe the acute and chronic complications of Diabetes Mellitus. Elaborate on the management of acute complications of Diabetes Mellitus. $10+10+30=50$
7. Discuss the stage of normal labour. Discuss the management of postpartum hemorrhage. $25+25=50$
8. Describe the steps for investigation of an Epidemic. Write short notes on *any two* of the following: $30+2 \times 10=50$
 - a) Levels of prevention
 - b) Point epidemic vs. Propagated epidemic
 - c) Cross sectional studies vs. Longitudinal studies
 - d) Screening test vs. Diagnostic test

Sl.no.

Pages: 2

002

PHILOSOPHY

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the question.

Answer any five questions, selecting at least two /one from each section.

Question 1 is compulsory.

Section -A

1. What is Husserl's Phenomenological Reduction? What is its utility? Explain and discuss. 50
2. On what grounds Logical Positivists reject metaphysics and God? Discuss. 50
3. Does Hume accept the immortality of the soul? 50
4. Explain in detail the relationship between Form and Matter according to Aristotle? 50
5. Write short notes on *any two* of the following: 25×2=50
 - a) Locke's substance and qualities.
 - b) Hegel's Dialectical Method.
 - c) Plato's theory of Ideas.

d) Wittgenstein's Meaning and Use.

Section-B

500

6. What is the significance of Buddhist *Pratityasamutpada*? Explain. 50

7. What is the theory of knowledge according to Carvaka? How its theory of knowledge leads to the rejection of the existence of God? 50

8. Write short notes on *any two* of the following: 25×2=50

- a) Aurobindo's Integral Yoga.
- b) The theory of bondage and liberation according to Jainism.
- c) Nyaya's Pramana.
- d) Sankara's Brahman.

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006

Pages: 2

PHILOSOPHY

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the question.

Answer any five questions, selecting at least two /one from each section.

Question 1 is compulsory.

Section -A

1. Discuss and explain the importance of the concept of Liberty. 50
2. What are the sources and structures of gender discrimination?
How gender equity can be brought? 50
3. What are the serious ecological problems facing humanity today?
What are the remedial measures do you suggest for the restoration of better eco-system? 50
4. Write short notes on *any two* of the following: $25 \times 2 = 50$
 - a) The ideal relationship between the individual and the state.
 - b) Is secularism compatible with humanism?
 - c) Arguments for and against capital punishment.
 - d) Distinction between socialism and Marxism.

Section-B

5. How philosophical understanding of Liberation is different from religious belief about liberation? 10
6. What is the relationship between religion and morality? Can an individual be moral without religion? 50
7. Can the claim for Absolute Truth be compatible with plurality of religion? Discuss? 50
8. Write short notes on any two of the following : 25×2=50
 - a) Can the immortality of the soul be proved? Explain
 - b) The nature of religious experience.
 - c) Is the nature of religious language very different from ordinary language? Explain
 - d) On what grounds the various contradictory claims of the religious knowledge through revelation and faith among different religions be resolved? Discuss.

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010

Pages 6

PHYSICS
PAPER-I
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Answer Question No.1, which is compulsory and Four from the remaining Questions.

Assume suitable data, if considered necessary and indicate the same clearly.

Use the following values of physical constants if necessary.

Velocity of light, c	$= 3 \times 10^8 \text{ m/s}$
Planck's constant, h	$= 6.63 \times 10^{-34} \text{ J s}$
Electronic charge, e	$= 1.6 \times 10^{-19} \text{ C}$
Permittivity of free space, ϵ_0	$= 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$
Permeability of free space, μ_0	$= 4\pi \times 10^{-7} \text{ Tm A}^{-1}$
Mass of electron, m_e	$= 9.11 \times 10^{-31} \text{ kg}$
Mass of proton, m_p	$= 1.672 \times 10^{-27} \text{ kg}$
Mass of neutron, m_n	$= 1.674 \times 10^{-27} \text{ kg}$
Boltzmann constant, k	$= 1.38 \times 10^{-23} \text{ J-K}^{-1}$
Avogadro's number, N_A	$= 6.023 \times 10^{23}/\text{mole}$
Stefan's constant, σ	$= 5.67 \times 10^{-8} \text{ Wm}^{-2}\text{K}^{-4}$

1. Answer Any Five from the following :

a) Calculate the moment of inertia of a short solid cylinder of radius 20 cm and length 12 cm about its own axis ; given density of the material is 9gm/cc.

10

b) In the laboratory, the life time of a particle moving with a speed of 2.8×10^{10}

[1]

PTO

cm/s is found to be 2×10^{-7} s. Calculate the proper lifetime of the particle. 10

c) In a Newton's ring experiment the radius of the 10th and the 20th rings are 0.2 cm and 0.3 cm respectively and the focal length of the plano-convex lens is 90cm. Calculate the wavelength of the light used. 10

d) Write Poisson's and Laplace's equations. Check if the following functions (i) $f(x, y) = x^2 - y^2$ and (ii) $g(x - y) = x^2 + y^2$ satisfy the two dimensional Laplace's equation. 2+4+4=10

e) Calculate the fall in temperature produced by adiabatic demagnetization of a paramagnetic salt at an initial temperature 2K when the magnetic field is reduced from 10,000 oersted to zero. [Given Curie's constant per gram mole per cc = 0.042 erg degree/gram oersted and $C_H = 0.42$ joule gram⁻¹ deg⁻¹. 10

f) Two lenses of power +2.5D and -5D are kept coaxially separated by a distance of 30cm. Find the position of the first and second principal points. 10

2. Answer part (a) and any Three from the rest :

a) State the characteristics of motion under central force. 5

b) Show that the angular momentum of a particle under the influence of a central force always remains constant. 15

c) Determine the gravitational potential and field at a point (i) inside and (ii) outside a spherical shell. Draw a neat diagram to show the variation of potential with distance from the center due to a spherical shell. 6+4+3+2=15

d) Obtain an expression for the velocity and acceleration of a particle moving in a uniformly rotating frame. 7+8=15

- e) Explain center of mass and laboratory reference frames. A particle of mass m_1 suffers an elastic collision with another of mass m_2 initially at rest. Prove that the kinetic energies of two colliding particles in the centre of mass frame are inversely proportional to their masses. $6+9=15$

3. Answer part (a) and any Three from the rest :

- a) Discuss how the negative results obtained in Michelson-Morley experiment are interpreted. 5
- b) State perpendicular and parallel axis theorem. Use appropriate theorem to find the moment of inertia of a rectangular lamina about an axis through the center-of-mass and perpendicular to its plane. $4+4+7=15$
- c) Explain the terms precessional motion and precessional torque. Obtain an expression for the time period of precessional motion of a gyroscope. $4+4+7=15$
- d) Derive the equations of Lorentz transformation and deduce the complete relation for addition of velocities. $7+8=15$
- e) Deduce the Einstein's mass equivalence relation and give its physical significance. $10+5=15$

4. Answer part (a) and any Three from the rest :

- a) Discuss the characteristics of SHM. 5
- b) Discuss mathematically the phenomena of forced vibration and explain the phenomena of sharpness of resonance. $9+6=15$
- c) Obtain an expression for the achromatic combination of two thin coaxial lenses separated by a finite distance. What will be the condition when the two lenses are of the same material? $10+5=15$

d) What are nodal points and nodal planes? Give their properties. Show that nodal planes are planes of unit magnification. $3+3+5+4=15$

e) Explain the phenomena of reflection and refraction from Huygen's principle. $7+8=15$

5. Answer part (a) and any Three from the rest :

a) What is holography? Mention one of its simple application. $4+1=5$

b) What do you understand by double refraction? What are ordinary and extraordinary rays and how will you show that these are plane polarized. $5+2+3+5=15$

c) Discuss the Fraunhofer diffraction pattern due to a single slit. Derive the condition for production of maxima and minima and state their position. Find the expression for the width of central maxima. $4+7+4=15$

d) What is a zone plate? Show that the radii of its half period zones are proportional to the square root of natural numbers. Derive an expression for its focal length and show that a zone plate has multiple foci. $4+4+4+3=15$

e) Define stimulated absorption and metastable state. Explain the terms "stimulated emission" and "spontaneous emission" giving their transition probabilities. What are Einstein's co-efficient? Derive the relation between them and explain. $2+2+3+3+2+3=15$

6. Answer part (a) and any Three from the rest :

a) Explain mean and rms values of an alternating voltage. 5

b) What is an electrical image? A point charge $+q$ is placed at a distance of d from an infinite plane earthed conductor, calculate (a) field at any point on the conductor and (b) work done in removing the charge $+q$ to infinity. $4+6+5=15$

c) A dielectric sphere is kept in a uniform electric field. Find an expression for the effective field inside and outside the sphere. Draw a neat diagram showing a distortion produced in the field. 6+6+3=15

d) An alternating e.m.f. $E_0 \sin \omega t$ is applied to a LCR series circuit. Obtain an expression for the instantaneous current, impedance, phase angle, condition for resonance and quality factor. 5+3+2+2+3=15

e) State Biot and Savart's law and use it to find an expression for the magnetic field at a point on the axis of a current carrying solenoid. Hence prove that the magnetic field at the end is half the magnetic field at the center of a long solenoid. 4+7+4=15

7. Answer part (a) and any Three from the rest :

a) What is displacement current ? 5

b) State and derive Poynting's theorem. Discuss the physical significance of each term in the resulting equation. 3+9+3=15

c) Write the Maxwell's equation of Electromagnetic theory and identify the symbols used. Using these equations, derive the general wave equation for electric and magnetic vectors for electromagnetic waves in vacuum. 9+6=15

d) Discuss reflection and refraction of a plane electromagnetic wave at a boundary of two dielectrics and hence establish the laws of reflection. 10+5=15

e) Derive Planck's radiation formula for black body radiation. Show that in the limiting case this formula leads to either Rayleigh Jean's law or Wien's radiation law. 10+5=15

8. Answer part (a) and any Three from the rest :

a) Write the expressions for the three critical constants and hence show that $P_c V_c / T_c = 3R/8$, where R is universal gas constant. 5

b) What is Joule-Kelvin effect ? Deduce an expression for Joule-Kelvin coefficient and temperature of inversion. Explain in brief how this effect is used in regenerative cooling method to liquify gases. 4+6+2+3=15

c) Write Maxwell thermodynamic relations. Deduce Clausius-Clapeyron equation starting from Maxwell thermodynamic relations and hence discuss how melting point of a liquid depends on pressure. 4+6+5=15

d) What is Bose-Einstein condensation ? Obtain an expression for condensation temperature. 10+5=15

e) List the assumptions of Debye's theory of specific heat of solids ? Derive a relation for lattice heat capacity following Debye model and compare the results with the experimental observations. 4+6+5=15

Sl. no. 008

Pages 6

PHYSICS
PAPER-II
(OPTIONAL)
MARKS : 250
TIME : 3 HOURS

The figures in the margin indicate full marks for the questions

Candidate should attempt Question No.1, which is compulsory and Four of the remaining Questions, selecting at least ONE from each section.

Assume suitable data, if considered necessary and indicate the same clearly.

Use the following values of physical constants if necessary.

Velocity of light, c	$= 3 \times 10^8 \text{ ms}^{-1}$
Planck's constant, h	$= 6.63 \times 10^{-34} \text{ J s}$
Electronic charge, e	$= 1.6 \times 10^{-19} \text{ C}$
Permittivity of free space, ϵ_0	$= 8.857 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
Permeability of free space, μ_0	$= 4 \pi \times 10^{-7} \text{ Tm A}^{-1}$
Mass of electron, m_e	$= 9.1 \times 10^{-31} \text{ kg}$
Boltzmann constant, k_B	$= 1.38 \times 10^{-23} \text{ JK}^{-1}$
Avogadro's number, N_A	$= 6.023 \times 10^{23} / \text{mole}$
Stefan's constant, σ	$= 5.67 \times 10^{-8} \text{ Wm}^{-2} \text{ K}^{-4}$

1. Answer Any Five questions :

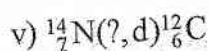
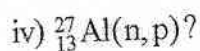
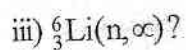
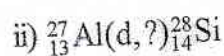
a) Fill in the missing particles or elements in the following nuclear reactions:

10

i) ${}_{48}^{113}\text{Cd}(n, \gamma)$

[1]

PTO


b) Compute the Q-value and threshold energy for the reaction ${}_{9}^{19}\text{F}(n, p){}_{8}^{19}\text{O}$.

Atomic masses are : ${}_{9}^{19}\text{F} = 18.998404 \text{ u}$, ${}_{8}^{19}\text{O} = 19.003577 \text{ u}$,

 ${}^1_1\text{H} = 1.007825 \text{ u}$ and $n = 1.008665 \text{ u}$.

10

c) Copper has fcc structure and its atomic radius is 0.1278 nm . Calculate its density. Given : atomic weight of copper is 63.5 .

10

d) Prove the following Boolean identities :

 $5 \times 2 = 10$

i) $ABC + \overline{A}BC + AB\overline{C} = A(B + C)$

ii) $AB + \overline{A}C + BC = AB + \overline{A}C$

e) Calculate the wavelength separation between the unmodified line of wavelength $6000 \text{ \AA}$ and modified lines in normal Zeeman Effect when a magnetic induction of 1 Wbm^{-2} is applied.

10

f) The HCl molecule gives the vibrational absorption line of wavelength $3.465 \times 10^{-6} \text{ m}$. Calculate the force constant of the H-Cl bond. Given that

 ${}^1_1\text{H} = 1.0087 \text{ u}$, ${}^{35}_{17}\text{Cl} = 35.453 \text{ u}$, and $u = 1.67 \times 10^{-27} \text{ kg}$.

10

g) What is the uncertainty in the speed of an electron confined in a space of linear dimension of $1 \text{ \AA}$?

10

- h) Components of two arbitrary vectors **A** and **B** commute with Pauli's spin matrices. Prove that $(\sigma \cdot A)(\sigma \cdot B) = A \cdot B + i \sigma \cdot (A \times B)$ 10

SECTION-A

2. a) Write down Schrodinger time dependent equation in 3-dimension. Establish continuity equation for probability density and probability current density. Show that current density is a real quantity. 2+10+3=15

- b) A particle of mass 'm' is trapped in a cubical box of side 'L'. The particle is capable of moving freely inside the box. How does potential energy vary for this problem? Solve the Schrodinger equation to find the normalised wave function and energy of the particle. Enumerate the energy of five lower most energy levels of the particle. 3+12+5=20

- c) What do you mean by expectation value of an operator? Write the expression for expectation value of operator A. Normalized wave function of a particle is given by $\psi(x) = 2\alpha \sqrt{\alpha} x e^{-\alpha x}$ for $x > 0$
 $= 0$ for $x < 0$

Calculate $\langle x \rangle$ and $\langle p_x \rangle$. 3+2+5+5=15

3. a) L_x , L_y and L_z are the components of angular momentum operator **L** in cartesian coordinate system. Prove that :

i) $[L_x, L_y] = i\hbar L_z$

ii) $[L^2, L_z] = 0$

iii) $[L_z, P_z] = 0$

What are the physical significances of these relations? 3+5+4+3=15

[3]

PTO

b) Find the expression for angular momentum operator L^2 in spherical polar coordinate system. 20

c) Spin angular momentum S is related to Pauli's spin matrices by $S = \frac{1}{2} \hbar \sigma$.

Use the properties of angular momentum operators to show : 5x3=15

i) $\sigma_x^2 + \sigma_y^2 + \sigma_z^2 = 3$

ii) $[\sigma_x, \sigma_y]_+ = 0$

iii) $\sigma_x \sigma_y = i \sigma_z$

4. a) What is H_α line ? Discuss about the fine structure of H_α line on the basis of Sommerfeld's relativistic atom model and vector atom model. 3+5+7=15

b) What are normal and anomalous Zeeman effects ? With suitable energy level diagrams discuss the Zeeman splitting of sodium D_1 and D_2 lines. 6+14=20

c) Consider two electrons, one in the 4p and the other in the 4d sub shell. Obtain the L, S and J value and spectroscopic symbols for this two electron system. 3+12=15

5. a) What is Raman Effect ? Give a quantum mechanical explanation of this effect ? What are Stokes and anti-Stokes lines ? Which one of these lines are more intense and why ? 2+6+4+3=15

b) The first line ($J=0$) in the rotation spectra of CO appears at 3.84235 cm^{-1} . Calculate the length of the CO bond. Given : atomic weight of carbon is 12 and atomic weight of oxygen is 16. 15

6. A diatomic molecule is executing a rotational motion like a rigid rotator. Using Bohr's quantum condition estimate the rotational energy of the molecule at different energy level. What will be the energy if one applies eigen value relation for the angular momentum operator. 12+8=20

SECTION-B

6. a) What are nuclear fission and nuclear fusion? Give one example each. Describe in brief the major processes involved in the energy production in the sun. 4+2+9=15

b) What are the uses of moderator and control rods in a nuclear reactor? Give one example each. 5+5=10

c) Assuming the speed of π -meson to be the same as speed of light and range of nuclear force to be 2×10^{-15} m, estimate the mass of π -meson in MeV. 10

d) Write the expression for semi-empirical mass formula. Explain the origin of various terms of the expression. 3+12=15

7. a) What are leptons and quarks? Name the particles of different generations of quarks and leptons. 4+6=10

b) What are hadrons? Write the quark contents of (i) proton, (ii) neutron, (iii) Δ^{++} and (iv) Ω^- particles. 2+8=10

c) Calculate the packing fraction of bcc lattice. 10

d) Discuss about the behaviour of superconductor in magnetic field. 10

e) Find an expression for inter planer spacing in a cubic crystal. 10

8. a) Draw the circuit diagram of a pnp transistor amplifier working in common emitter mode. Also draw the h-parameter equivalent diagram. Explain the function of the amplifier with the help of load line. Calculate the input impedance and current gain. $2+2+6+5+5=20$

b) Describe the construction and working principle of n-channel enhancement type MOSFET. $5+10=15$

OR

Draw a circuit diagram to study the characteristics of a JFET. Draw a typical set of drain characteristics and explain the different parts of it. $3+2+10=15$

c) State and prove de-Morgan's theorem. $5+10=15$

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Sl.no. 021

Pages: 2

POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the questions.**Answer any five questions including the Question no. 1, which is compulsory, selecting at least one question from each section.****Section -A**1. Comment on *any two* of the following in about 250 words each :

25×2=50

- a) New Social Movements.
- b) Gramsci's view on hegemony.
- c) Neo-liberal Theory of the State.
- d) Humanism of M.N. Roy.

2. Why was Plato keen on communism of property and wives for the Philosopher Rulers? How is Plato's communism different from the communism propounded by Marx? 50

3. 'Rawlsian Justice is a strong defence of liberty and equality but falls short of expectations of both Marxists and Liberals'. Comment. 50

4. Do you think that collapse of Soviet Union has made the ideology of Socialism irrelevant? Give reasons for your answer. 50

Section-B

5. Examine the impact of the Government of India Act, 1935 on the drafting of the Indian Constitution. 50
6. Is Governor the representative of the Centre or the head of the province? Elucidate the role of the Governor in the light of the recommendations of various Commissions. 50
7. Write a critical estimate on the role of the Election Commission of India. Examine the Constitutional safeguards for its autonomy. 50
8. Do you think that reservation for women in local self-government under the 73rd and 74th Amendment of the Indian Constitution has really empowered women? Give justification for your answer. 50

Sl.no.

Pages: 2

015

POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the questions.

Answer *any five* questions including the Question no. 1, which is compulsory, selecting at least one question from each section.

Section -A

1. Comment on *any two* of the following in at out 250 words each :
25×2=50
 - a) Rostow's model of Development.
 - b) Collective security of the United Nations.
 - c) Morgenthau's Realism.
 - d) WTO
2. What do you understand by the 'Balance of Power'? Why is the role of balancer crucial in the present day unequal powers of the world?
50
3. Is Non-Aligned Movement irrelevant at the present juncture? Discuss the circumstances for its origin and find out the causes for its decline.
50
4. What are the grounds, in your opinion, for the restructuring of the UN Security Council? Why is India so keen on becoming the permanent member of the Security Council?
50

B-5-8.

1

Section-B

5. What are the major determinants of India's foreign policy? What are the institutions involved in the making of India's foreign policy? 50
6. How has nuclearisation of India and Pakistan altered the power equation in Indian subcontinent? Elucidate. 50
7. Discuss the role of terrorism issue in Indo-US relations. Suggest measures to be adopted by these two countries to deal with terrorism. 50
8. What are India's arguments for not signing Nuclear Non-Proliferation Treaty? What are its consequences? 50

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Sl.no.

004

Pages: 2

PSYCHOLOGY

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The question paper comprises of two section. *Section A is compulsory*, out of which two needs to be attempted & from *section B any four* question needs to be attempted.

Section-A

1. Answer *any two* of the following question (each answer should not exceed 250 words) $25 \times 2 = 50$
 - a) Write a note on the Indian approach to personality
 - b) Write a note on influence of child rearing practices on the growth and development of individual
 - c) Write a note on the status of psychology with reference to interdisciplinary approach

Section-B

2. Answer *any four* of the following question (each answer should not exceed 750 words) $50 \times 4 = 200$
 - a. What are the different methods of measuring attitude? Which among these is the most popular one and why?
 - b. Compare and contrast the interview and the questionnaire as tools of data collection.
 - c. Briefly point out the nature of motivation. Describe the theories of motivation with suitable examples of everyday life.
 - d. Comment on the importance of language in thinking. Describe the basic components of language development.

- e. Examine the concept of nature and nurture related to perception.
- f. Critically analyze the application of classical and operant conditioning in solving problems of everyday life.
- g. 'Sometimes, despite our best efforts, we are unable to solve problems'. Justify the statement describing the steps involved in problem solving. Suggest strategies to facilitate effective problem solving.

Sl.no.

Pages: 2

004

PSYCHOLOGY

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The question paper comprises of two section. *Section A* is compulsory, out of which two needs to be attempted & from *section B* any four question needs to be attempted.

Section-A

1. Answer *any two* of the following question (each answer should not exceed 250 words) 25×2=50
 - a) What are the factors influencing Positive Health & Quality of life?
 - b) Write a note on the consequences of social media usage, especially on young people.
 - c) Write a note on substance use and rehabilitation programs with reference to north east India.

Section-B

2. Answer *any four* of the following questions (each answer should not exceed 750 words) 50×4=200
 - a. Comment on the changing attitudes and concepts of mental health and well-being with special reference to India.
 - b. 'Leadership is considered as a backbone of an organization'. Justify the statement describing the various theories of leadership.
 - c. Depression among youth especially college youth is similar to other adults, but the causes behind the condition is quite different. Critically analyse the statement and suggest strategies to overcome depression among youth.

- d. Describe the ethical concerns that need to be kept in mind while using psychological tests.
- e. Discuss the role of community psychologists in bringing about social change.
- f. 'Development of good psychological test requires thoughtful and sound application of established principles of test construction'. Describe the steps involved in test construction.
- g. Explain elaborately the various techniques used by psychoanalytically oriented therapists to deal with patients suffering from poor mental health.

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Sl.no.

Pages: 2

PUBLIC ADMINISTRATION

035

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the question.

Candidates should attempt Question no. 1, which is compulsory, and other 4 (four) of the remaining question, selecting at least two from each Section.

Section-A

1. Answer **any two** of the following in not more than 250 words each. 25×2=50

- a) "To raise the performance of public bureaucracy, the remedy has to be sought more and more in terms of private markets where the structure and incentive system exist for the supply of public services" (William Niskanen). In the light of the statement, explain the public choice theory/approach to the understanding of public administration.
 - b) Explain the categories of motivation theories with special reference to Maslow and Herzberg.
 - c) Critically analyze whether the Right to Information Act has been able to ensure checks, transparency and accountability of the administration to the public.
 - d) Critically examine the advantages and disadvantage of delegated legislation.
2. 'Good Governance is associated with efficient and effective administration in a democratic frame-work' (Asmerom). Elucidate.

50

3. 'Human Relations Theory is based on a premise that the 'human problem requires a human solution', since, happier workers are secret to a successful organization.' Elucidate 50
4. Discuss typologies, role and functions of the chief executive. 50

Section-B

5. Answer *any two* of the following in not more than 250 words each
25×2=50

- a) Explain the changing profile of development administration.
- b) Discuss the importance and needs of human resource development.
- c) Explain the meaning and process of formulation of budget.
- d) Write a note on code of conduct and discipline in civil service.

6. 'All reforms are changes, but all changes cannot be considered as reforms'. In the light of the statement, critically discuss the various aspects of administrative reforms. 50

7. 'The public policy-making process is one way of understanding the means through which conflicting demands are reconciled and resolved in orderly, if not always satisfactory fashion'. In the light of the statement, discuss the significance and process of formulation of public policy. 50

8. Discuss meaning and significance of e-governance in an age of information technology. 50

Sl.no.

Pages: 2

043

PUBLIC ADMINISTRATION

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the question.

Candidates should attempt Question no. 1, which is compulsory, and other 4 (four) of the remaining questions, selecting at least two from each Section.

Section-A

1. Answer *any two* of the following in not more than 250 words each: 25×2=50
 - a) Discuss the major areas of British legacy in Indian administration.
 - b) Explain main features of Parliamentary democracy.
 - c) Examine the function and limitation of State Secretariat.
 - d) Highlight the problems of autonomy and accountability of public sector undertakings in India.
2. 'There are increasing problems of population, pollution, environment degradation and health risks in most of cities in India'. In the light of the statement, discuss the role and functions of urban local government. 50
3. 'After independence, the structure, tasks and role of district administration in India have undergone a massive change'. Elucidate. 50

4. Critically examine the powers and functions of the President of India. 50

Section-B

5. Write short note on *any two* of the following in not more than 250 words each 25×2=50

- Civil service neutrality.
- Rural development programmes.
- Role of civil society.
- Planning with reference to NITI Aayog.

6. Critically examine the role of finance ministry in monetary and fiscal policy. 50

7. Examine the role of central and state agencies in maintenance of law and order problems. 50

8. Critically discuss the major areas of conflict in the center-state relations. 50

Sl.no.

Pages: 1

043

SOCIOLOGY

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the questions.

Candidates should attempt five questions. Question no. 1 is compulsory.

1. Trace the emergence of Sociology as a discipline and discuss its scope. 25+25=50
2. What is positivism? Critically discuss the relevance of positivism for sociological research. 20+30=50
3. Write on the contributions of Max Weber to the study of social action? 50
4. What is social fact? What are the social functions of religion? Explain with examples. 20+30=50
5. What is social stratification? Explain the functionalist theory of social stratification as propounded by Davis and Moore. 15+35=50
6. Outline the features of pre-industrial and industrial economic system. 25+25=50
7. Define marriage and discuss different forms of marriage 10+40=50
8. What is social change? Discuss the role of Education as an instrument of social change. 20+30=50

Sl.no.

Pages: 1

058

SOCIOLOGY

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the questions.

Candidates should attempt five question. Question no. 1 is compulsory.

1. Indological and structural functionalism perspectives have contributed to the study of Indian society. Explain how? 25+25=50
2. Outline industrial and agrarian class structures in India. What are the factors responsible for the rise of middle class? Elucidate. 15+15+20=50
3. Discuss drug addiction as a social problem. Suggest remedial measures to overcome this problem. 25+25=50
4. Discuss the distinctive features of tribal communities. What are the major problems faced by tribal communities in India? 20+30=50
5. What is urbanization? Slum development programme is an integral part of the urban development. Do you agree? Explain. 15+35=50
6. Do you think religious fundamentalism is a threat to national integration? Explain 50
7. Outline the social consequences of land reforms and green revolution that were carried out in India. 50
8. Discuss the various atrocities and discriminations that are faced by women in India. What are the reasons responsible for these? Elucidate 25+25=50

Sl.no.

Pages: 2

008

ZOOLOGY

PAPER-I

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and *any four* from the rest

1. Write brief notes on *any four* of the following: 12.5×4=50

- Parasitic adaptation of Ascaris
- Social Insects
- General features of egg laying mammals
- Biogeochemical cycle
- Transgenic animals
- Electron Microscopy

2. a) Give an account of the different modes of reproduction in Protozoa with suitable diagrams. 25

b) "Birds are glorified reptiles"- justify the statement with anatomical, embryological and paleontological evidences. 25

3. a) What is polymorphism? Give an account of polymorphism in coelentrata with labelled diagram. Write a note on its significance. 3+20+2=25

b) What is fish migration? Write an account on different types of fish migration with examples. 3+22=25

4. a) Write an account of the life cycle of Taenia solium with suitable diagram. Write a note on pathogenesis and prophylaxis in taeniasis.

20+5=25

- b) What are endocrine glands? Draw a diagram showing the histological features of Pancreas. Name and explain the functions of Pancreatic hormones. What is the relation between Pancreas and diabetes?

2+4+15+4=25

5. a) Write an essay on the different types of mouth parts in insects with suitable illustration.

25

- b) Give an account of different integumentary derivatives in mammals.

25

6. a) What is succession? Explain the general process of succession.

What are hydrosere and xerosere.

3+15+7=25

- b) What are major sources of water pollution? Discuss the nature of pollutants involved and suggest methods of control.

10+10+5=25

7. a) What is ethology? Discuss courtship behavior with reference to Drosophila, 3-spine stickleback fish and birds.

3+22=25

- b) Write an account on methods of studying animal behavior.

25

8. a) Explain what are the different measures of Central tendency and give their relative merits and demerits.

25

- b) Find the Arithmetic mean from the frequency table given below:

25

Marks obtained by students	52	58	60	65	68	70	75
No. of students	7	5	4	6	3	3	2

Sl.no.

Pages: 2

015

ZOOLOGY

PAPER-II

(OPTIONAL)

Full Marks – 250

Time – 3 hours

The figures in the margin indicate full marks for the question.

Answer Question No. 1 and *any four* from the rest

1. Write brief notes on *any four* of the following: 12.5×4=50

a) Multiple alleles

b) Haemoglobin

c) DNA finger – printing

d) Thermoregulation

e) Nucleic acids

f) Stem cells

2. a) Give an account of protein synthesis in prokaryotes. 25

b) Write a note on structure and functions of Mitochondria. 25

3. a) Why did Mendel choose sweet pea for his experiment? What are the characters Mendel selected for his study? Explain Mendel's laws of inheritance with suitable diagrams. 3+5+17=25

b) What is cloning? Distinguish between Southern, Western and Northern blotting. Discuss the use of Plasmid as cloning vector? 2+15+8=25

4. a) Give an account of modern hypothesis of origin of life with reference to Oparin-Haldane hypothesis. Explain Miller-Urey experiment. 15+10=25

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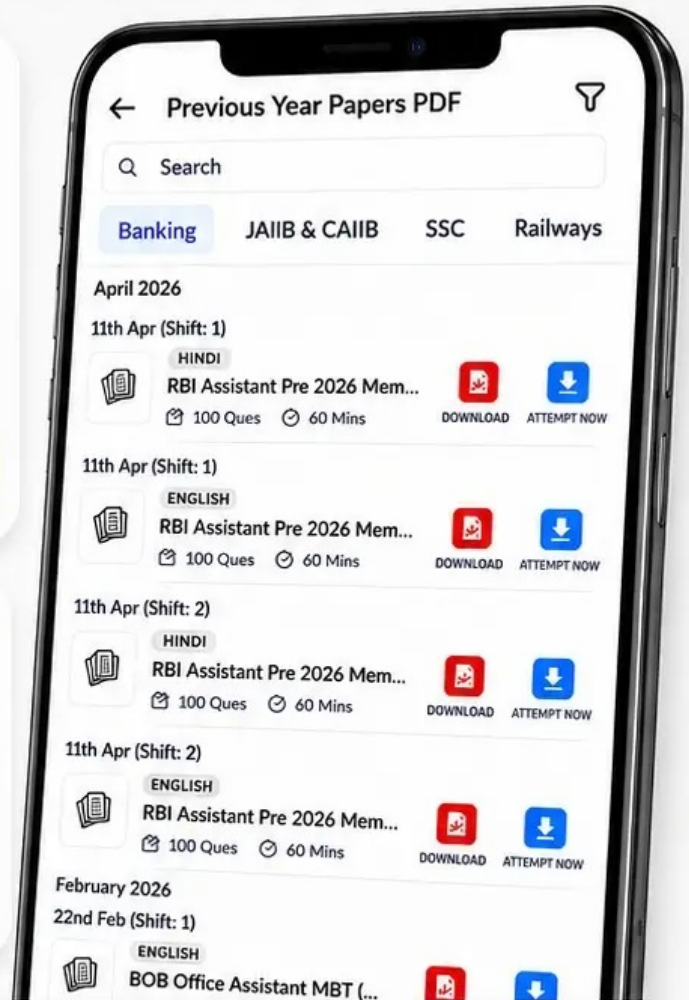
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- b) What is continental drift? How continental drift influence the animal distribution. 5+20=25
5. a) What are vitamins? Classify vitamins on the basis of their solubility. Give an account of functions of different types of vitamins. 3+10+12=25
- b) Explain the mechanism of oxygen and carbon dioxide transport in blood. 25
6. a) Give an account of the different steps in Kreb's cycle with the help of schematic diagram. 25
- b) What are immunoglobulins? Draw and describe the general structure of immunoglobulin. Explain humoral and cell mediated immunity. 3+10+12=25
7. a) Explain the ultra structure of skeletal muscle fibre. Discuss the biochemical mechanism of skeletal muscle contraction. 12 ½ +12 ½
- b) What is nephron? Give an account of the physiology of urine formation with a neat labelled diagram. 13+22=25
8. a) Discuss the process of spermiogenesis in a vertebrate with suitable diagram. 25
- b) What is gastrulation? Write an account of gastrulation in chick upto the formation of three germ layers. 3+22=25
