SSC
JE

Previous Year Paper
(Civil) Paper-II
06 Nov, 2024

Junior Engineer Civil Mechanical and Electrical Examination 2024 Paper II 6th Nov 2024

Exam Date	06/11/2024
Exam Time	9:00 AM - 11:00 AM
Subject	Junior Engineer 2024 Paper II Civil

Section : **General Engineering Civil And Structural**

Q.1 A laboratory compaction test conducted on a soil sample having specific gravity equal to 2.65 gave a maximum dry density of 1.8 g/cm^3 and a degree of saturation of 96%. Take density of water ρ_w = 1 g/cc. Find the optimum moisture content and air content.

Ans
✔ 1. 17.10% ; 4%
✘ 2. 16.75% ; 2%
✘ 3. 15.58% ; 5.6%
✘ 4. 17.98% ; 6%

Q.2 A simply supported beam of span 'L' with rectangular cross-section of 100 mm width and 200 mm depth is subjected to a point load at its mid-span (point A). Calculate the magnitude of point load acting, if maximum shear stress at the section below the point A is 1.50 N/mm^2.

Ans
✔ 1. 20000 N
✘ 2. 24000 N
✘ 3. 28000 N
✘ 4. 16000 N

Q.3 Estimate the quantity of earthwork for a portion of road using the trapezoidal formula, in which distance between the sections of the road D = 30m and cross-sectional areas A_0 = 5.5 m^2, A_1 = 11.5 m^2, A_2 = 17 m^2 and A_3 = 24.5 m^2.

Ans
✘ 1. 1478 m^3
✘ 2. 1256 m^3
✘ 3. 1189 m^3
✔ 4. 1305 m^3

Q.4 In a traverse surveying, the direction of a survey line 'PQ' of length 137 m, measured in whole circle bearing system, is found to be 35°00'. Calculate the latitude of the aforementioned survey line.

Ans
✘ 1. 123.33 m
✘ 2. 78.57 m
✔ 3. 112.23 m
✘ 4. 93.59 m

Q.5 Identify the type of slab based on the sizes of reinforced cement concrete slabs given here.

Slab$_1$: L_y=7m, L_x=3m

Slab$_2$: L_y=4m, L_x=3m (where L_y is length of longer span of slab and L_x is length of shorter span of slab)

Ans
1. Slab$_1$ - Two way
Slab$_2$ - One way
2. Slab$_1$ - One way
Slab$_2$ - One way
3. Slab$_1$ - Two way
Slab$_2$ - Two way
4. Slab$_1$ - One way
Slab$_2$ - Two way

Q.6 Match the following air pollutants with their respective types.

Type of Pollutant	**Pollutant**
1. Primary air pollutant	a. Ozone
2. Secondary air pollutant	b. Carbon monoxide
3. Primary air pollutant	c. Nitrogen dioxide
4. Secondary air pollutant	d. Sulphuric acid

Ans
1. 1-d; 2-b; 3-c; 4-a
2. 1-b; 2-c; 3-d; 4-a
3. 1-b; 2-d; 3-c; 4-a
4. 1-b; 2-d; 3-a; 4-c

Q.7 Which of the given statements with respect to the manufacture of ordinary Portland cement is correct?

Statements:

i) Use of gypsum in making cement avoids flash set of cement.

ii) The manufacture of cement by the wet process requires less fuel when compared to that required by the dry process.

iii) When the temperature in a rotary kiln reaches 750°C, clinker formation takes place.

Ans
1. i, ii and iii
2. Only i and ii
3. Only i
4. Only ii and iii

Q.8 Open channel flow is subcritical when Froude number is ____.

Ans
✗ 1. zero
✗ 2. equal to unity
✗ 3. more than unity
✓ 4. less than unity

Q.9 Which of the following variations in magnetic declination are correctly paired with their respective causes?

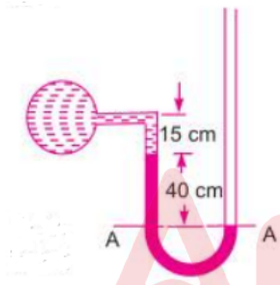
1. Diurnal variation – Temperature variation may cause this type of variation

2. Secular variation – Earthquakes may cause this type of variation

3. Irregular variation – Magnetic storms may cause this type of variation

Ans
✗ 1. 1, 2 and 3
✗ 2. Only 1 and 2
✗ 3. Only 2 and 3
✓ 4. Only 1 and 3

Q.10 A simple U tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.5 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Calculate the vacuum pressure in the pipe. (Take acceleration due to gravity as 10 N/cm^2)



Ans
✗ 1. –84460 N/cm^2
✗ 2. –48957 N/cm^2
✗ 3. –62450 N/cm^2
✓ 4. –55150 N/cm^2

Q.11 The length of a survey line measured with a 30 m chain was found to be 350 m. Calculate the true length of the line if the chain was 12 cm too long.

Ans
✗ 1. 349.42 m
✗ 2. 350.8 m
✓ 3. 351.4 m
✗ 4. 352.2 m

Q.12 In a reinforced cement concrete structure, a deformed bar of diameter 20 mm confirming to IS-1786 is subjected to tension. Calculate its development length to be provided. Take design bond stress in limit state method for 20 mm plain bar subjected to tension as 1.5 N/mm^2 and grade of steel Fe415.

Ans
✗ 1. 788.68 mm
✗ 2. 722.24 mm
✗ 3. 688.72 mm
✓ 4. 752.18 mm

Q.13 A coarse grained soil has a void ratio of 0.7 and specific gravity 2.7. Calculate the critical gradient at which quick condition will occur.

Ans
✗ 1. 0.93
✓ 2. 1.00
✗ 3. 1.25
✗ 4. 0.97

Q.14 Calculate the number of sleepers required for a railway track with an 800 m long BG section. (Take sleeper density as M+5 and length of one rail as 13 m)

Ans
✓ 1. 1108
✗ 2. 654
✗ 3. 1098
✗ 4. 1352

Q.15 According to Mohr's Hardness Scale, the hardness value of quartz is _____.

Ans
✗ 1. 10
✗ 2. 2
✗ 3. 5
✓ 4. 7

Q.16 Which of the following is an example of a drier used in varnish?

Ans
✗ 1. Mastic
✗ 2. Shellac
✗ 3. Amber
✓ 4. Lead acetate

Q.17 According to which method of balancing the traverse, is 'the total error in latitudes and in departure distributed in proportion to the latitudes and departure of the sides'?

Ans
✗ 1. Graphical method
✗ 2. The axis method
✗ 3. Transit method
✓ 4. Bowditch's method

Q.18 Study the following statements with respect to characteristics of contour lines, and identify the correct option.

i. Contours do not pass through permanent structures such as buildings.

ii. Contours of different elevations cannot cross each other (caves and overhanging cliffs are the exceptions).

iii. A contour line must close upon itself, though not necessarily within the limits of the map.

Ans
✗ 1. ii and iii only
✓ 2. i, ii and iii
✗ 3. i and ii only
✗ 4. i and iii only

Q.19 The force per unit area that must be exerted in order to extract water from soil is known as _____.

Ans
✗ 1. soil moisture stress
✗ 2. soil moisture deficiency
✓ 3. capillary potential
✗ 4. moisture equivalent

Q.20 Match the following qualities and tests that are done to find them with respect to bricks (includes different classes).

Qualities	**Tests done to determine these qualities**
A. Hardness	P. Pressing the brick till it breaks
B. Absorption	Q. No impression should be left on the surface the brick
C. Soundness	R. Not more than 20 per cent of weight of dry brick
D. Compressive strength	S. Should give clear ringing sound

Ans
✗ 1. A–Q; B–R; C–P; D–S
✓ 2. A–Q; B–R; C–S; D–P
✗ 3. A–P; B–Q; C–S; D–P
✗ 4. A–Q; B–P; C–S; D–R

Q.21 The criteria for minimum and maximum area of tension steel requirement in reinforced concrete beams (singly reinforced and designed as per Limit state method) as per IS 456 : 2000 are _____ and ____, respectively. (Notations: As – area of steel, b – breadth of beam, d – effective depth of beam, D – overall depth of beam, f_y – characteristic yield strength of steel reinforcement)

Ans
1. $\frac{As_{min}}{b\,d} \geq \frac{0.85}{f_y}\,;\, \frac{As_{max}}{b\,D} \leq 0.04$
2. $\frac{As_{min}}{b\,d} \geq \frac{0.78}{f_y}\,;\, \frac{As_{max}}{b\,D} \leq 0.04$
3. $\frac{As_{min}}{b\,d} \geq \frac{0.75}{f_y}\,;\, \frac{As_{max}}{b\,D} \leq 0.4$
4. $\frac{As_{min}}{b\,d} \geq \frac{0.8}{f_y}\,;\, \frac{As_{max}}{b\,D} \leq 0.05$

Q.22 Which of the following geological formations are correctly paired with their respective classification of rocks?

1. Gabbro – Igneous rock
2. Peridotite – Sedimentary rock
3. Diatomite – Metamorphic rock
4. Schist – Metamorphic rock

Ans
1. Only 1 and 4
2. 1, 2, 3 and 4
3. Only 1, 2 and 3
4. Only 1 and 3

Q.23 A prismatic bar with cross-section 30 mm × 30 mm and length 1 m is subjected to an axial tensile force of magnitude 90 kN. Calculate the Young's modulus of elasticity if it experiences a strain of 0.0005.

Ans
1. 167×10^3 N/mm^2
2. 200×10^3 N/mm^2
3. 230×10^3 N/mm^2
4. 182×10^3 N/mm^2

Q.24 Identify whether the given statements with respect to the determination of density of soil are correct or incorrect.

Statements:

A) Core cutter and sand replacement methods can be used for finding In-situ density of soil.

B) The water displacement method is suitable only for cohesive samples brought from the field.

Ans
✔ 1. Both statements are correct
✘ 2. Both statements are incorrect
✘ 3. Statement A is correct and B is incorrect
✘ 4. Statement B is correct and A is incorrect

Q.25 Heating asphalt with sand and mineral fillers produces _____.

Ans
✘ 1. distilled asphalt
✔ 2. mastic asphalt
✘ 3. asphaltic felt
✘ 4. asphaltic terrazzo

Q.26 In plate girders, the intermediate vertical stiffeners are provided to _____.

Ans
✘ 1. eliminate flange crippling
✘ 2. connect the two members
✔ 3. eliminate web buckling
✘ 4. connect the extra plate with flanges

Q.27 Differential manometers are used for measuring:

Ans
✘ 1. velocity at a point in a fluid
✘ 2. difference of velocity between two points
✔ 3. difference of pressure between two points
✘ 4. difference in density of fluid between two points

Q.28 The duty of an irrigation canal does NOT depend upon _____.

Ans
✘ 1. soil characteristics through which the canal runs
✘ 2. cultivation methods
✘ 3. method of application of irrigation water
✔ 4. reservoir storage

Q.29 'A certain amount of the gross rent is set aside annually to accumulate the total cost of construction when the life of building is over' is known as _____.

Ans
✔ 1. sinking fund
✘ 2. market value
✘ 3. loss of rent
✘ 4. salvage value

Q.30 Identify the correct pair with respect to primary and secondary air pollutants.

Type of Pollutant	Pollutant example
1. Primary air pollutant	Carbon dioxide
2. Secondary air pollutant	Peroxyacetyl nitrate
3. Primary air pollutant	Sulphur dioxide
4. Secondary air pollutant	Formaldehydes

Ans
✘ 1. 1, 3 & 4 only
✔ 2. 1, 2, 3 & 4
✘ 3. 1, 2 & 3 only
✘ 4. 2, 3 & 4 only

Q.31 Match the following with respect to IS specifications on drinking water quality as per IS 10500-2012.

Characteristics	**Acceptable limit**
1. Calcium	a. 250 mg/l
2. Chloride	b. 75 mg/l
3. Fluoride	c. 0.2 mg/l
4. Free residual chlorine	d. 1.0 mg/l

Ans
✘ 1. 1–a; 2–b; 3–d; 4–c
✘ 2. 1–d; 2–a; 3–b; 4–c
✔ 3. 1–b; 2–a; 3–d; 4–c
✘ 4. 1–b; 2–d; 3–a; 4–c

Q.32 Which of the following is INCORRECT with respect to functions of camber in roads?

Ans
1. It helps to drain off the rain water from the road surface quickly.
2. It prevents the entry of surface water into the pavement layers.
3. It reduces the contact of bituminous pavement layer with water for a longer duration to avoid the stripping of bitumen from the aggregates.
4. It provides structural stability and support to the edges of the pavements.

Q.33 As per IS 7861 (Part 2), any operation of concreting done at _____ atmospheric temperature or below is termed as cold weather concreting.

Ans
1. 7°C
2. 5°C
3. 10°C
4. 3°C

Q.34 In centrifugal pumps, cavitation is reduced by _____.

Ans
1. reducing the suction head
2. increasing flow velocity
3. reducing the discharge
4. throttling the discharge

Q.35 Match the following terminologies used in Irrigation Engineering with their explanation/example.

Terminology	Explanation / Example
1. Field capacity	a. Water content at which plants can no longer extract sufficient water from the soil for its growth
2. Permanent wilting point	b. The moisture content of the soil after free drainage has removed most of the gravity water
3. Commercial crop	c. Sugar cane
4. Plantation crop	d. Cocoa

Ans
1. 1-d, 2-a, 3-c, 4-b
2. 1-b, 2-a, 3-c, 4-d
3. 1-b, 2-a, 3-d, 4-c
4. 1-a, 2-b, 3-c, 4-d

Q.36 Identify whether the given statements is/are correct are incorrect with respect to chain surveying.

i) Chain surveying is suitable for surveys of a small extent on open grounds to secure data for the exact description of the boundaries of a piece of land.

ii) The principle of chain surveying is triangulation.

Ans
✔ 1. Both statements i and ii are correct
✘ 2. Both statements i and ii are incorrect
✘ 3. Only statement ii is correct
✘ 4. Only statement i is correct

Q.37 Calculate the volume of sand required for making 3 m^3 of concrete with a nominal mix in the proportion 1 (cement) : 2 (sand) : 4 (coarse aggregates) for the construction of an RCC beam.

Ans
✘ 1. 1.26 m^3
✔ 2. 1.32 m^3
✘ 3. 1.62 m^3
✘ 4. 1.54 m^3

Q.38 The Kaleshwaram Lift Irrigation Project, a multi-purpose irrigation project, is built on the _____ river.

Ans
✘ 1. Kaveri
✘ 2. Ganga
✘ 3. Brahmaputra
✔ 4. Godavari

Q.39 Identify whether the given statements with respect to fillet weld in comparison to groove weld are correct or incorrect.

Statements:

A) Fillet welds normally require less material preparation and are easier to fit than groove welds.

B) For a given amount of weld material, fillet welds are stronger than groove welds.

Ans
✘ 1. Both statements are correct
✘ 2. Statement B is correct and Statement A is incorrect
✘ 3. Both statements are incorrect
✔ 4. Statement A is correct and Statement B is incorrect

Q.40 Study the following statements with respect to cutback bitumen and identify the correct answer.

Statement A : Addition of petroleum hydrocarbon (Kerosene) decreases the viscosity of bitumen.

Statement B : Addition of petroleum hydrocarbon (Kerosene) increases the ability of bitumen to penetrate into asphalt concrete.

Ans
✗ 1. Statement A is correct and B is incorrect

✗ 2. Statement B is correct and A is incorrect

✓ 3. Both statements are correct

✗ 4. Both statements are incorrect

Q.41 A circular shaft of 20 mm diameter is required to transmit torque from one shaft to another. Find the safe torque which the shaft can transmit if the shear stress is not to exceed 30 MPa.

Ans
✗ 1. 12500 π N-mm

✗ 2. 20000 π N-mm

✓ 3. 15000 π N-mm

✗ 4. 17500 π N-mm

Q.42 According to Mohr-Coulomb theory of failure, useful in case of soils, which of the following statements is INCORRECT?

Ans
✗ 1. The ultimate strength of material is determined by the stresses on the potential failure plane.

✗ 2. Material fails essentially by shear.

✓ 3. The failure criterion depends on the intermediate principal stress.

✗ 4.
The critical shear stress causing failure depends upon the properties of the material as well as on normal stress on the failure plane.

Q.43 For the most economical Trapezoidal channel section, one of the sloping sides shall be equal to:

Ans
✗ 1. top width

✓ 2. half of top width

✗ 3. half of base width

✗ 4. base width

Q.44 _____ is an example of a drier used in varnish.

Ans
✗ 1. Copal

✓ 2. Litharge

✗ 3. Mastic

✗ 4. Turpentine

Q.45 Which of the following is NOT a factor used to calculate the effective net area of steel tension members?

Ans
✗ 1. Geometric factor
✗ 2. Ductility factor
✗ 3. Shear lag factor
✓ 4. Imperfection factor

Q.46 Identify the correct pair(s) from the following based on the types of cement and their respective IS specifications.

Type of cement	IS specifications
1. Initial setting time of ordinary Portland cement	Not more than 30 minutes
2. Initial setting time of sulphate resistant Portland cement	Not less than 45 minutes
3. Final setting time of sulphate resistant Portland cement	Not more than 600 minutes

Ans
✗ 1. Only 2
✗ 2. Only 1 and 3
✓ 3. Only 2 and 3
✗ 4. Only 3

Q.47 Select the option that is true regarding the following two statements labelled Assertion (A) and Reason (R) with respect to municipal solid waste collection.

(A): In hilly areas, waste collection should ideally start at the lowest point and proceed to higher levels.

(R): Collection of waste starts at the lowest point and proceeds to higher levels ensuring that waste collectors or waste collection vehicles need not carry increasing amounts of waste up steep slopes.

Ans
✓ 1. Both A and R are true and R is the correct explanation of A
✗ 2. Both A and R are true, but R is not the correct explanation of A
✗ 3. A is false, but R is true
✗ 4. A is true, but R is false

Q.48 As per IS7861 (part 1), any operation of concreting done at atmospheric temperatures above _____ (other than steam curing) is termed as hot weather concreting.

Ans
✓ 1. 40°C
✗ 2. 37°C
✗ 3. 47°C
✗ 4. 55°C

Q.49 Identify the correct statement related to circular shaft subjected to pure torsion.

Ans
✗ 1. At the outer surface of the shaft the shear stress is zero.

✗ 2.
If a moment is applied in a vertical plane containing the longitudinal axis of the beam, it will be subjected to torque causing torsion in the member.

✗ 3. The twist along the shaft is not uniform.

✓ 4.
Torque required to produce a twist of one radian per unit length of a shaft is termed as torsional rigidity.

Q.50 Which of the following factors is NOT considered for the selection of rails?

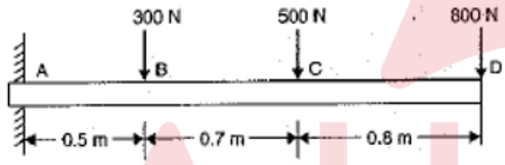
Ans
✗ 1. Spacing of sleepers

✗ 2. Speed of the train

✓ 3. Distance between successive railway stations

✗ 4. Gauge of the track

Q.51 Identify the INCORRECT statement by referring to a cantilever beam in the figure.



Ans
✗ 1. Bending moment at point C is greater than that at point D.

✗ 2. Shear force at point D is lesser than that at point B.

✓ 3. Shear force at point C is greater than that at point B.

✗ 4. Bending moment at point C is lesser than that at point B.

Q.52 As per IS 2000 (part 15):1987, the paint coefficient (multiplying factor) for fully glazed steel doors is _____.

Ans
✗ 1. 1.5 for each side

✗ 2. 1.0 for each side

✓ 3. 0.5 for each side

✗ 4. 2 for each side

Q.53 Calculate the length of a simple circular curve, if its deflection angle is 45° and radius 400 m.

Ans
✓ 1. 314.16 m

✗ 2. 326.19 m

✗ 3. 298.78 m

✗ 4. 227.89 m

Q.54 Match the following with respect to sewer appurtenances.

1. Storm water inlets	a. Provided to admit the surface runoff to the sewers.
2. Catch basins	b. Provided at the head of the sewers.
3.Flushing manholes	c. Provided to stop the entry of heavy debris present in the storm water into the sewers.

Ans
1. 1 – c, 2 – b, 3 – a
2. 1 – a, 2 – c, 3 – b
3. 1 – a, 2 – b, 3 – c
4. 1 – c, 2 – a, 3 – b

Q.55 A real fluid, in which the shear stress is NOT proportional to the rate of shear strain is called _____.

Ans
1. Newtonian fluid
2. ideal plastic fluid
3. ideal fluid
4. non-Newtonian fluid

Q.56 Identify the ODD option with respect to the classification of canals based on the discharge and function of the canal.

Ans
1. Power canal
2. Navigation canal
3. Branch canal
4. Carrier canal

Q.57 Which of the following is an electromagnetic distance measurement instrument used in surveying?

Ans
1. Prismatic compass
2. Pentagraph
3. Auto level
4. Tellurometer

Q.58 Which of the following is NOT a chief constituent used in acid refractories for the manufacture of ceramic materials?

Ans
✗ 1. Quartz
✓ 2. Magnesite
✗ 3. Silica
✗ 4. Ganister

Q.59 It is observed that in a road construction project the original sanctioned estimate is likely to be exceeded by more than 30% due to an increase in the cost of raw materials. The detailed estimate to be prepared for the situation is known as _____.

Ans
✓ 1. revised estimate
✗ 2. supplementary estimate
✗ 3. approximate estimate
✗ 4. abstract estimate

Q.60 Which of the following rock minerals is made of chemical composition 'calcium magnesium carbonate'?

Ans
✗ 1. Gypsum
✗ 2. Mica
✓ 3. Dolomite
✗ 4. Silicon dioxide

Q.61 A sand deposit has the following properties in its natural state.

i) Bulk unit weight : 19.5 kN/m^3

ii) Unit weight of soil solids : 25 kN/m^3

iii) Water content : 15%

Calculate the porosity of sand in its natural state.

Ans
✓ 1. 32.17%
✗ 2. 38.49%
✗ 3. 28.32%
✗ 4. 34.79%

Q.62 Study the following statements with respect to compaction of soil and identify the correct option.

Statement A: Fine-grained soils attain a much higher density and lower optimum water content when compared to well graded coarse-grained soils.

Statement B: Compacted density of soil increases as water content increased, till a maximum dry density is achieved.

Ans
✔ 1. Statement B is correct and A is incorrect
✗ 2. Both statements are correct
✗ 3. Both statements are incorrect
✗ 4. Statement A is correct and B is incorrect

Q.63 As per the assumptions made in the design of RCC members for limit state of collapse in flexure, the maximum strain in the tension reinforcement in the section at failure shall not be less than _____. (Take grade of steel as Fe415 and modulus of elasticity of steel as E_s.)

Ans
✗ 1. $\frac{327.58}{E_s}+0.002$
✗ 2. $\frac{360.87}{E_s}+0.002$
✔ 3. $\frac{415}{E_s}+0.002$
✗ 4. $\frac{477.25}{E_s}+0.002$

Q.64 Study the following statements and identify the correct option with respect to factors affecting permeability of soil medium.

Statement A: Permeability is directly proportional to the viscosity of water and inversely proportional to its unit weight.

Statement B: Degree of saturation of soil medium alters the permeability through soil.

Ans
✗ 1. Both statements are incorrect
✗ 2. Both statements are correct
✗ 3. Statement A is correct and B is incorrect
✔ 4. Statement B is correct and A is incorrect

Q.65 As per IS 10500-2012, the acceptable limit of lead content in drinking water is _____.

Ans
✗ 1. 0.05 mg/l
✗ 2. 0.001 mg/l
✗ 3. 0.00 mg/l
✔ 4. 0.01 mg/l

Q.66 Which of the following laws states that the strength of cement concrete is only dependent upon water to cement ratio provided the mix is workable?

Ans
✔ 1. Abrams' law
✘ 2. Powers' law
✘ 3. Stefan's law
✘ 4. Coulombs' law

Q.67 The unit of measurement used for estimating quantity of surface dressing and levelling the earth surface is ____.

Ans
✔ 1. square metres
✘ 2. running metre
✘ 3. cubic metres
✘ 4. quintals

Q.68 A building requires 9 RCC columns of size 0.2 m breadth, 0.2 m thickness and 4 m height. Estimate the quantity of steel reinforcement required, if the steel reinforcement to be provided is 1.5% by their gross volume.

Ans
✘ 1. 1.798 quintal
✘ 2. 2.199 quintal
✘ 3. 1.585 quintal
✔ 4. 1.695 quintal

Q.69 Calculate the annual rate of depreciation by constant percentage method by taking the original cost of property = ₹15, 00,000, scrap value = ₹65, 000 and life in years 12.

Ans
✘ 1. 0.33
✘ 2. 0.19
✘ 3. 0.38
✔ 4. 0.23

Q.70 In theodolite, what will happen with respect to rotation of upper and lower plates, if the lower clamp is clamped and the upper clamp is unclamped?

Ans
✔ 1. Upper plate rotates on inner axis with relative motion between upper and lower plates.
✘ 2. Both upper and lower plates rotate together.
✘ 3. Lower plate rotates on outer axis with relative motion between upper and lower plates.
✘ 4. Instrument can rotate without any motion between two plates.

Q.71 A reinforced cement concrete cantilever beam is subjected to a uniformly distributed load with an intensity 'w' kN/m directed vertically upwards. The main reinforcement (longitudinal) shall be provided _____. Ignore the self-weight of beam.

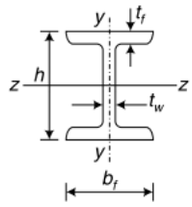
Ans
✗ 1. along the neutral axis

✗ 2. anywhere in the section of beam

✗ 3. below neutral axis

✓ 4. above neutral axis

Q.72 Which of the following buckling curves is applicable about z-z axis for a rolled steel I-section used as an axially loaded compression member shown in the given figure, if $(h/b_f) > 1.2$ and t_f </= 40 mm?



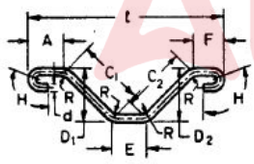
Ans
✗ 1. Class – d

✗ 2. Class – a

✓ 3. Class – c

✗ 4. Class – b

Q.73 Following IS : 2502-1963, in the preparation of bar bending schedule of reinforcements for reinforced concrete, the length of the reinforcement bar shown in the given figure is estimated as:



Ans
✗ 1. $l + C_1 + C_2 + 2H + \sqrt{C_1^2 - D_1^2} + \sqrt{C_2^2 - D_2^2}$

✓ 2. $l + C_1 + C_2 + 2H - \sqrt{C_1^2 - D_1^2} - \sqrt{C_2^2 - D_2^2}$

✗ 3. $l + C_1 + C_2 + 3H - \sqrt{C_1^2 - D_1^2} - \sqrt{C_2^2 - D_2^2}$

✗ 4. $A + C_1 + C_2 + E + F + 3H$

Q.74 Identify the correct pair(s) from the following based on maximum value of cross slope for different types of road surfaces as per IRC guidelines. Consider there is heavy rainfall in the region of road construction.

Type of road surface	Maximum value of cross slope
1.Thin bituminous surface	2.0%
2.Water bound macadam and gravel pavement	3.0%
3.Cement concrete and high type bituminous surface	2.0%

Ans
✗ 1. 1 only
✗ 2. 1 and 2 only
✓ 3. 1, 2 and 3
✗ 4. 2 and 3 only

Q.75 The compound responsible for causing permanent hardness is:

Ans
✗ 1. calcium bicarbonate only
✓ 2. calcium chloride
✗ 3. both calcium bicarbonate and magnesium bicarbonate
✗ 4. magnesium bicarbonate only

Q.76 _____ is characterised due to swelling caused by the growth of layers of sapwood over wounds after a branch has been cut off in an irregular manner.

Ans
✓ 1. Rind gall
✗ 2. Shakes
✗ 3. Foxiness
✗ 4. Knots

Q.77 Flow in an open channel is classified as turbulent if the Reynold's number of flow is _____.

Ans
✗ 1. less than 2000
✗ 2. more than 4000
✗ 3. less than 500
✓ 4. more than 2000

Q.78 Calculate the delta for a crop if its duty is 2000 hectares/cumec on the field. (Consider the base period of crop as 100 days.)

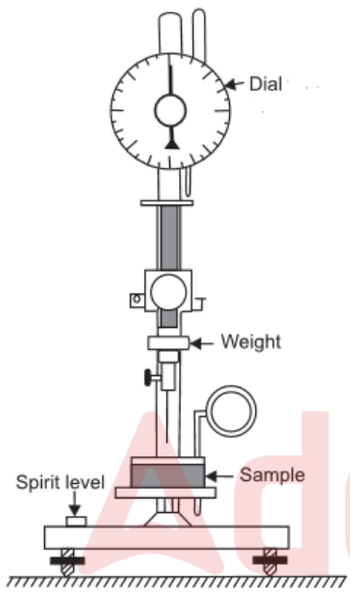
Ans
✗ 1. 0.246 m
✗ 2. 0.322 m
✗ 3. 0.532 m
✓ 4. 0.432 m

Q.79 Match the columns with respect to acceptable noise levels as specified in IS 4954:1968.

Location	Acceptable noise level
1. Outdoor noise level in rural residential areas	a. 25-30 dB
2. Indoor noise level in hospital building	b. 25-35 dB
3. Indoor noise level in radio and TV studio	c. 35-45 dB

Ans
✗ 1. 1-a, 2-b, 3-c
✓ 2. 1-b, 2-c, 3-a
✗ 3. 1-b, 2-a, 3-c
✗ 4. 1-c, 2-b, 3-a

Q.80 The instrument shown in the given figure is used for _____ on bitumen.



Ans
✓ 1. penetration test
✗ 2. softening point test
✗ 3. ductility test
✗ 4. viscosity test

Q.81 A commercial building is constructed on a 1000 m^2 plot of land. The plinth area is 800 m^2. The building fetches a gross rent of ₹50,000 per month. The total outgoing per year is ____, if,

1. the cost of repair is at the rate of 10% of income

2. the yearly property tax is ₹5 per m^2 of land and ₹40 per m^2 of plinth area.

Ans
✔ 1. ₹97,000

✘ 2. ₹42,000

✘ 3. ₹5,04,000

✘ 4. ₹55,000

Q.82 Match the columns with respect to types of canal based on canal alignment.

Types of canals	**Definitions**
1. Ridge canal	a. Canal that is aligned parallel to contours of the area
2. Contour canal	b. Canal aligned roughly at right angles to the contours and is neither on the watershed nor in the valley
3. Side slope canal	c. Canal aligned along a watershed and runs for most of its length on a watershed

Ans
✘ 1. 1-c; 2-b; 3-a

✘ 2. 1-a; 2-c; 3-b

✘ 3. 1-a; 2-b; 3-c

✔ 4. 1-c; 2-a; 3-b

Q.83 While aligning a hill road with a ruling gradient of 5%, a horizontal curve of radius 70 m is encountered. Find the grade compensation.

Ans
✘ 1. 1.60%

✘ 2. 1.20%

✘ 3. 1.36%

✔ 4. 1.42%

Q.84 Identify the correct option related to the given Assertion and Reason.

Assertion (A): By providing air vessels on the suction and delivery sides of a reciprocating pump, it is possible to increase the delivery head of the pump.

Reason (R): The air vessel eliminates the acceleration head and makes discharge uniform.

Ans
✗ 1. Both A and R are true and R is not the correct explanation of A

✗ 2. Both A and R are true and R is the correct explanation of A

✓ 3. A is false but R is true

✗ 4. A is true but R is false

Q.85 The overall efficiency of a centrifugal pump when head is 25 m, discharge = 0.04 m^3/s, output power p = 16 kW is _____.

Ans
✗ 1. 65%

✗ 2. 60%

✗ 3. 68.5%

✓ 4. 62.5%

Q.86 Select the option that is true regarding the following two statements labelled Assertion (A) and Reason (R) with respect to influence of aggregate to cement ratio on fresh concrete properties of concrete.

(A): If the aggregate to cement ratio of a concrete mix is increased the concrete mix becomes lean.

(R): The quantity of paste available for lubrication decreases, if the aggregate to cement ratio is increased.

Ans
✗ 1. A is false but, R is true

✗ 2. A is true but, R is false

✗ 3. Both A and R are true, but R is not the correct explanation of A

✓ 4. Both A and R are true and R is the correct explanation of A

Q.87 The PCU recommended by the IRC for agricultural tractors on rural roads is:

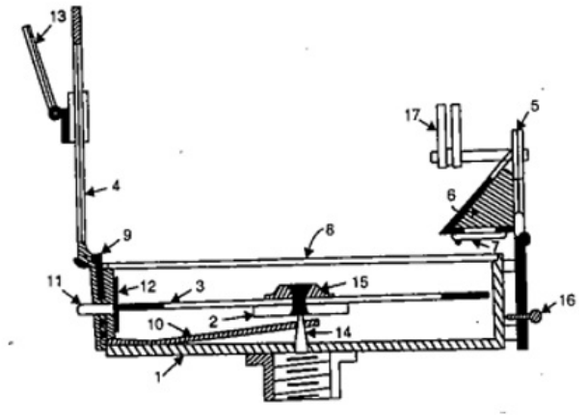
Ans
✗ 1. 1.0

✗ 2. 3.0

✗ 3. 0.5

✓ 4. 1.5

Q.88 Study the given figure and identify the correct pairs with respect to different parts of the prismatic theodolite.



Ans
1. 14- Agate cap , 13- Mirror, 15- Pivot , 11- Brake pin
2. 11- Agate cap , 13- Mirror, 14- Pivot , 15- Brake pin
3. 15- Agate cap , 13- Mirror, 14- Pivot , 11- Brake pin
4. 15- Agate cap , 13- Mirror, 11- Pivot , 14- Brake pin

Q.89 Which of the following is NOT a mode of local failures in steel beams?

Ans
1. Torsional buckling
2. Buckling of thin flanges of section
3. Local crushing of web
4. Shear yield of web

Q.90 Calculate the bulk modulus of an alloy body if its modulus of elasticity is found to be 180 Gpa. Consider that the Poisson's ratio of tested material as 0.25.

Ans
1. 120 GPa
2. 140 GPa
3. 100 GPa
4. 160 GPa

Q.91 Calculate the depth of neutral axis (measured from extreme compression fibre) of a singly reinforced concrete beam (simply supported) of size 200 mm (width) × 450 mm (depth), reinforced with 2 numbers of 16 mm diameter steel bars. Use M20 grade concrete, Fe415 steel, xu max/d = 0.48 and effective cover thickness = 35 mm

Ans
1. 100.82 mm
2. 88.74 mm
3. 199.82 mm
4. 50.41 mm

Q.92 Select the option that is true regarding the following two statements labelled Assertion (A) and Reason (R) with respect to Kennedy's theory applicable for channel design.

(A): Kennedy assumed that silt is kept in suspension.

(R): According to Kennedy's assumption Eddy's generated from the bed only.

Ans
✗ 1. A is false but, R is true

✓ 2. Both A and R are true and R is the correct explanation of A

✗ 3. Both A and R are true, but R is not the correct explanation of A

✗ 4. A is true but, R is false

Q.93 What role does the 'schedule of rates' play in the preparation of cost estimates for civil engineering works?

Ans
✗ 1. It determines the interest rates for project financing.

✗ 2. It outlines the project timeline and milestones.

✗ 3. It calculates the cost of construction equipment.

✓ 4. It provides a detailed list of unit rates for various items of work.

Q.94 Match the columns with respect to different traffic signs used in traffic engineering.

1. Regulatory signs	A. prohibitory signs, restriction end signs, stop and give way signs, etc.
2. Warning sings	B. cross road, side road right, narrow bridge, etc.
3. Informatory signs	C. parking signs, flood gauge, facility information sign, etc.

Ans
✓ 1. 1→A, 2→B, 3→C

✗ 2. 1→A, 2→C, 3→B.

✗ 3. 1→C, 2→A, 3→B

✗ 4. 1→B, 2→C, 3→A

Q.95 Identify the correct pair(s) from the following based on standard load taken for a specified penetration in California Bearing Ratio test on soil.

Penetration depth	Standard load
1. 2.5 mm	1370 kg
2. 5 mm	2080 kg
3. 7.5 mm	2780 kg

Ans
✗ 1. Only 1
✗ 2. Only 3
✗ 3. Only 2 and 3
✓ 4. Only 1 and 2

Q.96 The infiltration capacity of soil does NOT depend on _____.

Ans
✗ 1. initial soil moisture content
✗ 2. permeability of soil
✓ 3. rain fall intensity
✗ 4. type of crop grown at the considered location

Q.97 Identify the type of weld made between the two plates shown in the given figure.

Ans
✗ 1. Continuous fillet weld
✗ 2. Flat fillet weld
✓ 3. Groove weld
✗ 4. Lap weld

Q.98 The compressive strength of structural granite, when tested according to IS 1121 (part I) : 1974, shall not be less than _____.

Ans
✗ 1. 325 N/mm^2
✗ 2. 144.44 N/mm^2
✓ 3. 98.06 N/mm^2
✗ 4. 208 N/mm^2

Q.99 Calculate the number of standard modular bricks of size 19×9×9 cm required for a masonry work of total volume 5 m^3. (Consider 5% breakages wastage)

Ans
✗ 1. 2825 numbers
✓ 2. 2625 numbers
✗ 3. 2720 numbers
✗ 4. 2680 numbers

Q.100 Identify whether the given statements with respect to plate load test used to find ultimate bearing capacity of soil are correct or incorrect.

Statements:

A) The plate load test is a laboratory test used to find ultimate bearing capacity of soil.

B) The bearing plate is either circular or square, made of steel not less than 25 mm in thickness.

Ans
✓ 1. Statement B is correct and A is incorrect
✗ 2. Both statements are incorrect
✗ 3. Both statements are correct
✗ 4. Statement A is correct and B is incorrect