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2017 Paper 4

(General Engineering Science)

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Question Booklet Series

Question Booklet

C

Paper—IV

GENERAL ENGINEERING SCIENCE

Time Allowed : 1 Hour

SECTION—I

Maximum Marks : 100

(Objective)

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. This Question Booklet contains **50** questions in all.
2. All questions carry equal marks.
3. Attempt **all** questions.
4. **Immediately after commencement of the examination, you should check up your Question Booklet and ensure that the Question Booklet Series is printed on the top right-hand corner of the Booklet. The Booklet contains 7 printed pages and no page or question is missing or unprinted or torn or repeated. If you find any defect in this booklet, get it replaced immediately by a complete booklet of the same series.**
5. You must write your Roll Number in the space provided on the top of this page. Do not write anything else on the Question Booklet.
6. An Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. **You must write your Name, Roll No. and other particulars on the first page of the Answer Sheet provided, failing which your Answer Sheet will not be evaluated.**
7. You will encode your **Roll Number** and the **Question Booklet Series A, B, C or D** as it is printed on the top right-hand corner of this Question Booklet with Black/Blue ballpoint pen in the space provided on **Page-2** of your Answer Sheet. **If you do not encode or fail to encode the correct series of your Question Booklet, your Answer Sheet will not be evaluated correctly.**
8. Questions and their responses are printed in English only in this Booklet. Each question comprises **four** responses—(A), (B), (C) and (D). You are to select **ONLY ONE** correct response and mark in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
9. In the Answer Sheet, there are **four** brackets—(A), (B), (C) and (D) against each question. To answer the questions you are to **mark with Black/Blue ballpoint pen ONLY ONE** bracket of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. **Any erasure or change is not allowed.**
10. You should not remove or tear off any sheet from the Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. **After the examination has concluded, you must hand over your Answer Sheet to the Invigilator.** Thereafter, you are permitted to take away the Question Booklet with you.
11. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.

SEAL

1. The bending moment of a cantilever beam of length l and carrying a uniformly distributed load of w per unit length is _____ at the fixed end.
 (A) $wl/4$ (B) $wl/2$
 (C) wl (D) $wl^2/2$
2. A line joining the apex of a triangle to some fixed point on the opposite side is called a
 (A) check line
 (B) tie line
 (C) base line
 (D) None of the above
3. The angle of intersection of the horizon glass and index glass in an optical square is
 (A) 30° (B) 45°
 (C) 60° (D) 75°
4. An imaginary line tangential to the longitudinal curve of the level at the center of the tube is called
 (A) horizontal axis
 (B) vertical axis
 (C) axis of the level tube
 (D) line of collimation
5. In order to measure a horizontal angle more accurately than a Vernier, a method of
 (A) repetition is used
 (B) reiteration is used
 (C) deflection angles
 (D) double observation is used
6. Collimation method is used in
 (A) profile levelling
 (B) differential levelling
 (C) check levelling
 (D) Both (A) and (B)
7. A bar chart is drawn for
 (A) time versus activity
 (B) activity versus resources
 (C) resources versus progress
 (D) progress versus time
8. CPM is
 (A) activity oriented
 (B) event oriented
 (C) time oriented
 (D) resource oriented
9. PERT requires
 (A) single time estimate
 (B) double time estimate
 (C) triple time estimate
 (D) None of the above
10. In CPM the cost slope is determined by
 (A) Crash cost / Normal cost
 (B) Crash cost - Normal cost / Normal time - Crash time
 (C) Normal cost / Crash cost
 (D) Normal time - Crash time / Crash cost - Normal cost

11. Coefficient of discharge is equal to
 (A) $C_c \times C_v$
 (B) $C_c \times C_r$
 (C) $C_v \times C_r$
 (D) C_c / C_r
12. The loss of head at entrance in a pipe is
 (A) $v^2 / 2g$
 (B) $0.5v^2 / 2g$
 (C) $0.375v^2 / 2g$
 (D) $0.75v^2 / 2g$
13. The kinematic viscosity of an oil (in stokes) whose specific gravity is 0.95 and viscosity 0.011 poise is
 (A) 0.0116
 (B) 0.116
 (C) 0.0611
 (D) 0.611
14. Whenever a plate is held immersed at some angle with the direction of flow of the liquid, it is subjected to some pressure. The component of this pressure, at right angles to the direction of flow of the liquid is known as
 (A) lift
 (B) drag
 (C) stagnation pressure
 (D) bulk modulus
15. The loss of head due to friction in a pipe of uniform diameter in which a viscous flow is taking place is
 (A) $1 / R_N$
 (B) $4 / R_N$
 (C) $16 / R_N$
 (D) $64 / R_N$
16. The processes occurring in open system which permit the transfer of mass to and from the system are known as
 (A) flow processes
 (B) non-flow processes
 (C) adiabatic processes
 (D) None of the above
17. The gas constant (R) is equal to the _____ of two specific heats.
 (A) sum
 (B) difference
 (C) product
 (D) ratio
18. The area under the temperature entropy curve ($T-s$ curve) of any thermodynamic process represents
 (A) heat absorbed
 (B) heat rejected
 (C) Both (A) and (B)
 (D) None of the above

19. Carnot cycle consists of
- (A) two constant volumes and two isentropic processes
 - (B) two isothermal and two isentropic processes
 - ✓(C) two constant pressures and two isentropic processes
 - (D) one constant volume, one constant pressure and two isentropic processes
20. Otto cycle is also known as
- (A) constant pressure cycle
 - ✓(B) constant volume cycle
 - (C) constant temperature cycle
 - (D) constant temperature cycle and pressure cycle
21. The efficiency of diesel cycle approaches to Otto cycle efficiency when
- (A) cutoff is increased
 - ✓(B) cutoff is decreased
 - (C) cutoff is zero
 - (D) None of the above
22. The coefficient of coupling between two coils is 0.45. The first coil has an inductance of 75 mH and the second coil has an inductance of 105 mH. What is the mutual inductance between the coils?
- (A) 3.54 mH
 - ✓(B) 39.9 mH
 - (C) 7.88 mH
 - (D) 189.3 mH
23. What would happen if a power transformer designed for operation on 50 Hz (frequency) were connected to a 5 Hz (frequency) source of the same voltage?
- (A) No effect
 - ✓(B) Eddy current and hysteresis loss will be excessive
 - (C) Transformer may start to smoke
 - (D) Current will be too much low
24. In three-phase transformer, the load current is 139.1 A, and secondary voltage is 415 V. The rating of the transformer would be
- (A) 50 kVA
 - ✓(B) 57.72 kVA
 - ✓(C) 100 kVA
 - ✓(D) 173 kVA
25. Thevenin resistance R^{Th} is found
- ✓(A) by removing voltage sources along with their internal resistances
 - (B) by short circuiting the given two terminals
 - (C) between any two open terminals
 - (D) between same open terminals as for E_{th}
26. What happens to the MMF when the magnetic flux decreases?
- (A) Increases
 - ✓(B) Decreases
 - (C) Remains constant
 - (D) Becomes zero

27. The compressive strength of a good Portland cement and standard sand mortar after 3 days of curing should not be less than
- (A) 7 MN/m²
(B) 11.5 MN/m²
☒ (C) 17.5 MN/m²
(D) 21 MN/m²
28. Eminently hydraulic lime is one in which the percentage of silica, alumina and iron oxide is
- (A) 5%–10%
☒ (B) 10%–25%
(C) 25%–30%
(D) 30%–40%
29. With increase in moisture content, bulking of sand
- (A) increases
(B) decreases
(C) first increases to a certain maximum value and then decreases
☒ (D) first decreases to a certain minimum value and then increases
30. The vehicle used in bronze paints is usually
- (A) linseed oil
(B) naphtha
(C) water
☒ (D) nitrocellulose lacquer
31. The number of vertical joints in a stretcher course is x times the number of joints in the header course, where x is equal to
- ☒ (A) $\frac{1}{2}$
(B) 1
(C) 2
(D) $\frac{1}{4}$
32. The maximum total settlement for isolated foundations on clayey soils should be limited to
- (A) 25 mm
☒ (B) 40 mm
(C) 65 mm
(D) 100 mm
33. 'Killed steels' are those steels
- (A) which are destroyed by burning
(B) which after their destruction are recycled to produce fresh steel
☒ (C) which are deoxidized in the ladle with silicon and aluminium
(D) which have poor properties due to improper manufacturing
34. Eutectoid steel contains which of the following percentage of carbon?
- (A) 0.02% (B) 0.3%
(C) 0.63% ☒ (D) 0.8%

35. The amount of water used for 1 kg of distemper is
(A) 0.2 liter (B) 0.4 liter
(C) 0.6 liter (D) 0.8 liter
36. What is used to make paints odourless to some extent?
(A) Flat latex
(B) Celluloid sheets
(C) Acrylic compound
(D) Plioway resins
37. Which of the following units is **not** used to measure turbidity of water?
(A) NTU (B) ATU
(C) JTU (D) FTU
38. A sewer pipe contains 1 mm sand particles of specific gravity 2.65 and 5 mm organic particles of specific gravity 1.2, the minimum velocity required for removing the sewerage, is
(A) 0.30 m/s
(B) 0.35 m/s
(C) 0.40 m/s
(D) 0.45 m/s
39. If 2% solution of a sewage sample is incubated for 5 days at 20 °C and depletion of oxygen was found to be 5 ppm, BOD of the sewage is
(A) 200 ppm
(B) 225 ppm
(C) 250 ppm
(D) None of the above
40. The width of a rectangular sewer is twice its depth while discharging 1.5 m³/sec. The width of the sewer is
(A) 0.68 m (B) 0.88 m
(C) 1.36 m (D) 1.76 m
41. The dimension of a rectangular settling tank is—length 24 m, width 6 m and depth 3 m. If 2-hour detention period for tank is recommended, the rate of flow of sewage per hour, is
(A) 204 cu m
(B) 208 cu m
(C) 212 cu m
(D) 216 cu m
42. A circular solid disc of uniform thickness 20 mm, radius 200 mm and mass 20 kg, is used as a flywheel. If it rotates at 600 r.p.m., the kinetic energy of the flywheel, in joules is
(A) 395 (B) 790
(C) 1580 (D) 3160
43. A steel wheel of 600 mm dia on a horizontal steel rail carries a load of 500 N. The coefficient of rolling resistance is 0.3. The force in newton, necessary to roll the wheel along the rail is
(A) 0.5 (B) 5
(C) 1.5 (D) 150

44. During inelastic collision of two particles, which one of the following is conserved?
- (A) Total linear momentum only
☒ (B) Total kinetic energy only
☐ (C) Both (A) and (B)
 (D) None of the above
45. An annular disc has a mass m , inner radius R and outer radius $2R$. The disc rolls on a flat surface without slipping. If the velocity of the centre of mass is v , the kinetic energy of the disc is
- (A) $9/16mv^2$
 (B) $11/16mv^2$
 (C) $13/16mv^2$
 (D) $15/16mv^2$
46. A circular object of radius r rolls without slipping on a horizontal level floor with the point of contact between the object and the floor is
- (A) zero
 (B) V in the direction of motion
☒ (C) V opposite to the direction of motion
 (D) V vertically upward from the floor
47. If the Young's modulus and Poisson's ratio of the container material are 100 GPa and 0.3, respectively, the axial strain in the cylinder wall at mid-depth is
- (A) 2×10^{-5}
☒ (B) 6×10^{-5}
 (C) 7×10^{-5}
 (D) 1.2×10^{-4}
48. Two bars of different materials and same size are subjected to the same tensile force. If the bars have unit elongation in the ratio of 2 : 5, then the ratio of modulus of elasticity of the two materials will be
- ☒ (A) 2 : 5 (B) 5 : 2
 (C) 4 : 3 (D) 3 : 4
49. The ratio of bulk modulus to Young's modulus for a Poisson's ratio of 0.25 will be
- (A) $\frac{1}{3}$ ☒ (B) $\frac{2}{3}$
 (C) 1 (D) $\frac{3}{2}$
50. The total strain energy stored in a body is termed as
- ☒ (A) resilience
 (B) proof resilience
 (C) impact energy
 (D) modulus of resilience
