104/2025

Question Booklet Alpha Code **A**

Question Booklet Serial Number

Total No. of questions : 100 Time : 1 Hour 30 Minutes

Maximum : 100 Marks

INSTRUCTIONS TO CANDIDATES

1. The question paper will be given in the form of a Question Booklet. There will be four versions of question booklets with question booklet alpha code viz. A, B, C & D.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the question booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a question booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your question booklet is un-numbered, please get it replaced by new question booklet with same alpha code.
6. The question booklet will be sealed at the middle of the right margin. Candidate should not open the question booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the question booklet supplied to him contains all the 100 questions in serial order. The question booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the question booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball-Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

104/2025

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. The ratio between Longitudinal Stress and volumetric strain is known as:

(A) Bulk modulus (B) Shear modulus

(C) Rigidity modulus (D) All of the above

2. Ultimate strength and breaking strength in tensile loading is almost same for :

(A) Ductile materials

(B) Brittle materials

(C) Crystalline materials

(D) Amorphous materials

3. A bimetal strip of equal length for both metal is packed lengthwise in between two walls and the specimen is heated. Which material will be subjected to tension?

(A) Both specimen in equal amount

(B) The metal with higher thermal expansion coefficient

(C) The metal with lower thermal expansion coefficient

(D) There will be compression, instead of tension for both metals

4. If a simply supported beam of uniform cross section is centrally loaded in downward direction, according to the theory of simple bending, which portion will be subjected to compression?

(A) Portion above the neutral axis

(B) Portion below the neutral axis

(C) The neutral axis

(D) None of these

5. A torsionally equivalent shaft will have :

(A) Same angle of twist

(B) Same rigidity modulus

(C) Same torsional shear stress

(D) All the above

6. Maximum bending moment of a simply supported beam of uniform cross section and span L. with central point load W is given by the formula :

(A) WL/2 (B) WL/3

(C) WL/4 (D) $WL^2/2$

7. The point of contraflexure of a beam means :

(i) The point at which bending moment changes sign

(ii) The point at which shear force changes sign

(iii) This is also known as point of inflection

(iv) The point of zero shear force.

(A) (i) and (ii) are true

(B) (i) and (iii) are true

(C) (i) and (iv) are true

(D) (i), (iii) and (iv) are true

8. A rectangular beam of 12 cm wide and 10 cm deep is subjected to bending. If the maximum bending moment is 90 KN-m, then maximum bending stress is :

(A) 450 MN/m^2 (B) 900 MN/m^2

(C) 45 MN/m^2 (D) 90 MN/m^2

9. A simple shear stress acting on a body is accompanied by a complementary shear stress of equal magnitude acting in the _____ direction.

(A) Same direction (B) Axial direction

(C) Perpendicular direction (D) Longitudinal direction

10. Work done on a material in simple tension upto fracture is known as :

(A) Proof resilience (B) Modulus of resilience

(C) Modulus of toughness (D) All the above

11. Maximum principal stress theory is better applicable to :

(A) Brittle materials (B) Ductile materials

(C) Both (D) Impact loading

12. Strongest columns are those with _____ - slenderness ratio.

(A) Highest (B) Medium

(C) Extra large (D) Smallest

13. In the relation $PV^n = C$, the value of $n = \infty$ for the following process :

(A) Isothermal (B) Adiabatic

(C) Constant Volume (D) Constant Pressure

P represents the absolute pressure; **V** represents Volume and **C** is a Constant.

14. Second law of thermodynamics defines :

(A) Heat (B) Work

(C) Gibb's function (D) Entropy

15. The area under Temperature – Entropy curve for any thermodynamic process represents :

(A) Heat absorbed or rejected (B) Efficiency

(C) Work done (D) None of the above

16. A frictionless heat engine can be 100% efficient only if its exhaust temperature is :

(A) 0 K

(B) Equal to its input temperature

(C) 0°C

(D) 100°C

17. Characteristic gas constant of a gas is equal to :

(A) $\frac{C_p}{C_v}$ (B) $\frac{C_v}{C_p}$

(C) $C_p - C_v$ (D) $C_p + C_v$

where C_v is specific heat at constant volume and C_p is the specific heat at constant pressure

18. The changes in Gibbs energy for vaporization of pure substance is :

(A) Positive

(B) Negative

(C) May be positive or negative

(D) Zero

19. The Joule – Thomson coefficient μ is defined as :

(A) $\mu = \left(\frac{\partial T}{\partial P}\right)_H$ (B) $\mu = \left(\frac{\partial V}{\partial P}\right)_H$

(C) $\mu = \left(\frac{\partial T}{\partial P}\right)_S$ (D) $\mu = \left(\frac{\partial P}{\partial T}\right)_H$

T represents temperature, **P** is pressure, **H** is enthalpy, **V** is Volume and **S** is Entropy.

20. The most efficient process of compression is :

(A) Adiabatic (B) Isothermal

(C) Isentropic (D) None of the above

21. The expression $1 - \left(\frac{1}{r}\right)^{\gamma-1}$ denotes the following efficiency of an I.C engine :

(A) Mechanical efficiency (B) Air standard efficiency

(C) Volumetric efficiency (D) Relative efficiency

where ***r*** is the compression ratio and γ is the ratio of the two specific heats.

22. The main cause for the irreversibility is :

(A) Unrestricted expansion

(B) Mechanical and fluid friction

(C) Heat transfer with a finite temperature difference

(D) All of the above

23. The amount of heat absorbed to evaporate 1 kg of water from its saturation temperature, without change of temperature, is called :

(A) Latent heat of vaporization

(B) Sensible heat of water

(C) Enthalpy of steam

(D) Entropy of water

24. An open system is one in which :

(A) Mass does not cross boundaries of the system and energy cross the boundary

(B) Neither mass nor energy crosses, the boundaries of the system

(C) Mass crosses the boundary but not the energy

(D) Both energy and mass cross the boundaries of the system

25. The horizontal force on a curved surface immersed in a liquid equal :

(A) The weight of the column of liquid above the surface

(B) The pressure at the centroid multiplied by the area

(C) The force on the vertical projection on the surface

(D) The pressure multiplied by the average height of area

26. One of the following statements is true with regards to bodies that float or are submerged in liquids :

(A) For a body floating in a liquid the stability is ensured if the centre of buoyancy is below the centre of gravity

(B) For a body wholly submerged in a liquid the stability is ensured if the centre of buoyancy is above the centre of gravity of the body

(C) For a body floating in a liquid the stability is ensured if the centre of buoyancy is above the metacentre, regardless of the relative positions of centres of buoyancy and gravity.

(D) For a body floating in a liquid the stability is ensured if the centre of buoyancy is below the centre of gravity and the metacentre is below both the centres of gravity and buoyancy

27. The Euler's equation of motion is a statement of:

(A) Energy balance

(B) Conservation of momentum for an inviscid fluid

(C) Conservation of momentum for an incompressible flow

(D) Conservation of momentum for a real fluid

28. The Reynolds number for flow of a fluid in a circular tube is specified at 2500. What will be the Reynolds number when the tube diameter is increased by 20% and the fluid velocity is decreased by 40% keeping the fluid same :

(A) 200 (B) 1200

(C) 1800 (D) 3600

29. Velocity of flow through a circular pipe, measured at the centre is found to be 2 *m/s*. If the Reynolds number is 1200, what is the average flow velocity in the pipe :

(A) 2 *m/s* (B) 1.5 *m/s*

(C) 1 *m/s* (D) 0.5 *m/s*

30. The drag force exerted by a fluid on a body immersed in the fluid is due to :

(A) Pressure and viscous forces

(B) Pressure and gravity forces

(C) Pressure and surface tension forces

(D) Pressure and inertia forces

31. Which place in a draft tube is most susceptible for cavitation?

(A) Inlet of a draft tube (B) Draft tube exit

(C) Blade inlet (D) Guide blade

32. In order to have maximum power from a Pelton turbine, the bucket speed must be.

(A) Equal to the jet speed (B) Half of the jet speed

(C) Twice the jet speed (D) Independent of the jet speed

33. For negative value of slip, the coefficient of discharge in a reciprocating pump will be :

(A) Less than unity (B) More than unity

(C) Equal to unity (D) Infinite

34. Which one of the following statements is TRUE?

(A) Both Pelton and Francis turbines are impulse turbines

(B) Francis turbine is a reaction turbine but Kaplan turbine is an impulse turbine

(C) Francis turbine is an axial flow reaction turbine

(D) Kaplan turbine is an axial flow reaction turbine

35. For a Newtonian Fluid :

(A) Shear stress is proportional to shear strain

(B) Rate of shear stress is proportional to shear strain

(C) Shear stress is proportional to rate of shear strain

(D) Rate of shear stress is proportional to rate of shear strain

36. In a single-acting reciprocating pump without air vessel, the ratio of average friction head to maximum friction head in the suction/delivery pipe is :

(A) 1/3 (B) 1/2

(C) 1/4 (D) 2/3

37. The temperature at which the delta iron formed at range :

(A) Between 1400 °C and 1539 °C

(B) Between 910 °C and 1400 °C

(C) Above the melting point

(D) Room temperature

38. Which of the following material is most suitable for manufacturing of railway rails?

(A) Cast iron steel (B) High carbon steel

(C) Alloy steel (D) Mild steel

39. TTT diagram indicates time, temperature and transformation of :

(A) Ferrite (B) Austnite

(C) Pearlite (D) Cementite

40. How respresented the Gibbs phase rule of general system?

(F = Number of degree of freedom)

(C = Number of components)

(P = Number of phase)

(A) $P + F = C - 2$ (B) $P = C - 1 - F$

(C) $P = C + 1 - F$ (D) $P + F = C + 2$

41. Eutectoid product in Fe – C system is named as :

(A) Bainite (B) Ledeburite

(C) Pearlite (D) Spheroidite

42. Iron – Carbon equilibrium diagram :

(A) Is made by plotting carbon percentage along X-axis and temperature along Y-axis

(B) Correlates the microstructure and properties of steel and cast iron

(C) Indicates the phase changes occuring during heating and cooling

(D) All of the above

43. The closed packed hexagonal space lattice is found in :

(A) Zinc, magnesium, cobalt cadmium, antimony and bismuth

(B) Alpha iron, tungsten, chromium and molybdenum

(C) Gamma iron, aluminium, copper, lead, silver and nickel

(D) None of the above

44. The process of cyaniding and nitriding are the two methods of :

(A) Hardening (B) Normalising

(C) Case hardening (D) Tempering

45. Select the correct statement :

(A) Iron – Carbon and TTT diagram are both non equilibrium diagrams

(B) Iron – Carbon is a non-equilibrium but TTT diagram equilibrium diagram

(C) Iron – Carbon and TTT diagram, both are equilibrium diagrams

(D) Iron – Carbon is equilibrium diagram but TTT diagram is a non equilibrium diagram

46. An Atomic Packing Factor (APF) for the BCC unit cell of hard sphere atom will be :

(A) 0.73 (B) 0.68

(C) 0.63 (D) 0.78

47. Recrystallization temperature is :

(A) Crystal grow bigger in size

(B) The allotropic form changes

(C) New spherical crystals first begin to form from the old deformed one when the strained is heated

(D) Crystal first start forming from molten metal when cooled

48. Toughness in a steel is increased and brittleness is decreased by a heat treatment operation is called :

(A) Case hardening (B) Tempering

(C) Annealing (D) Normalising

49. Rankine cycle comprises of :

(A) Two isentropic processes and two isothermal processes

(B) Two isentropic processes and two constant pressure processes

(C) Two isentropic processes and two constant volume processes

(D) Two isothermal processes and two constant pressure processes

50. In a steam nozzle, for the same pressure ratio, the effect of friction leads to :

(A) Increase in dryness fraction of the exit steam and increase in exit velocity from the nozzle

(B) Decrease in dryness fraction of the exit steam and decrease in exit velocity from the nozzle

(C) Increase in dryness fraction of the exit steam and decrease in exit velocity from the nozzle

(D) Decrease in dryness fraction of the exit steam and increase in exit velocity from the nozzle

51. De-Laval turbine is an example of :

(A) Simple impulse turbine

(B) Reaction turbine

(C) Pressure compounded impulse turbine

(D) Velocity compounded impulse turbine

52. The standard firing order in a 4-cylinder petrol engine is :

(A) 1-4-3-2 (B) 1-3-4-2

(C) 1-2-4-3 (D) 1-4-2-3

53. Knocking in S.I. engines can be reduced by :

(A) Increasing the compression ratio

(B) Increasing air inlet temperature

(C) Increasing cooling water temperature

(D) Retarding the spark advance

54. In a two stage gas turbine plant, with intercooling and reheating :

(A) Both work ratio and thermal efficiency increases

(B) Both work ratio and thermal efficiency decreases

(C) Work ratio increases and thermal efficiency decreases

(D) Work ratio decreases and thermal efficiency increases

55. In reciprocating air compressors, the clearance ratio is given as the ratio of :

(A) Total volume of cylinder to clearance volume

(B) Clearance volume to total volume of cylinder

(C) Clearance volume to swept volume of cylinder

(D) Swept volume of cylinder to clearance volume

56. A Carnot refrigerator is working between 250K and 300K. Its COP is :

(A) 6/5 (B) 5/6

(C) 6 (D) 5

57. If an unsaturated air is passed through a spray of continuously recirculate water :

(A) Both dry bulb temperature and specific humidity increases

(B) Both dry bulb temperature and specific humidity decreases

(C) Dry bulb temperature increases and specific humidity decreases

(D) Dry bulb temperature decreases and specific humidity increases

58. A 10 mm diameter electric cable (k = 200 W/m-K) has to be provided with rubber insulation (k = 0.16 W/m-K) for safety purposes. The cable is exposed to atmosphere with heat transfer coefficient 8 W/m^2K. What should be the thickness of insulation to be provided so as to ensure maximum heat dissipation from the cable?

(A) 15 mm (B) 20 mm

(C) 40 mm (D) 100 mm

59. The correlation $Nu_D = 48/11$ holds good for heat transfer in :

(A) Laminar forced convection for flow over a flat plate with constant temperature boundary condition

(B) Laminar forced convection for flow over a flat plate with constant heat flux boundary condition

(C) Laminar forced convection for internal tube flow with constant temperature boundary condition

(D) Laminar forced convection for internal tube flow with constant heat flux boundary condition

60. Which law in thermal radiation gives a relationship between the temperature of a black body and the wavelength at which the maximum value of monochromatic emissive power occurs?

(A) Wien's displacement law

(B) Stefan-Boltzmann law

(C) Kirchhoff's law

(D) Planck's law

61. Two circular plates 1 and 2 with respective areas $A_1 = 2m^2$ and $A_2 = 5\,m^2$, are exchanging thermal radiation with each other. The shape factor of plate 1 to plate 2, F_{1-2} is 0.4. What is the shape factor of plate 2 to plate 1, F_{2-1} ? Assume the plates as black bodies

(A) 0.4 (B) 1

(C) 0.16 (D) 0.8

62. Which of the following statement is not an assumption used in LMTD analysis of heat exchangers?

(A) The overall heat transfer is constant

(B) Axial conduction is constant

(C) Specific heats and mass flow rates of the fluids are constant

(D) The flow conditions are steady

63. The degree of freedom, when the mechanism forms a structure is :

(A) 1 (B) Zero

(C) –1 (D) 2

64. Which of the following is an inversion of double-slider-crank chain?

(i) Whitworth Quick-return mechanism

(ii) Elliptical trammel

(iii) Scotch yoke

(iv) Rotary Engine

(A) Only (i) and (ii) (B) Only (ii) and (iii)

(C) Only (iii) and (iv) (D) Only (i), (ii) and (iii)

65. The sense of Coriolis component $2\omega V$ is the same as that of the relative velocity vector V :

(A) 90 degree in the direction of rotation of the link containing the path.

(B) 45 degree in the direction of rotation of the link containing the path.

(C) 45 degree in the direction opposite to the rotation of link containing the path.

(D) 180 degree in the direction of rotation of the link containing the path.

66. A differential gear in an automobile is a :

(A) Simple gear train (B) Reverted gear train

(C) Compound gear train (D) Epicyclic gear train

67. Which of the following type of viscous damping will give periodic motion to the vibrating body?

(i) Critical damping

(ii) Under damping

(iii) Over damping

(A) Only (i)
(B) Only (ii)
(C) Only (iii)
(D) Only (i) and (ii)

68. Primary forces in reciprocating engines :

(A) are partially balanced
(B) are completely balanced
(C) cannot be balanced
(D) are balanced by secondary forces

69. The angle of inclination of the crank to the line of stroke is, when swaying couple attains maximum or minimum :

(A) 90° and 135°
(B) 45° and 225°
(C) 135° and 225°
(D) 0° and 180°

70. Large field gun which comes to initial position after firing in possible time are :

(A) Critically damped
(B) Under damped
(C) Over damped
(D) Undamped

71. Which of the following theories is suitable for the design of cast iron component?

(A) Maximum Principal stress theory
(B) Maximum shear stress theory
(C) Distortion energy theory
(D) Strain energy theory

72. Ratio of the rivet hole diameter to the pitch of rivet when the tearing efficiency of the riveted joint is 40%

(A) 0.25
(B) 0.4
(C) 1
(D) 0.6

73. The design of transverse fillet welded joint is based on :

(A) Shear strength
(B) Tensile strength
(C) Bending strength
(D) Compressive strength

74. The bearing characteristic number is, if Z is absolute viscosity of the lubricant, N is speed of journal and P is bearing pressure :

(A) $\frac{ZP}{N}$ (B) $\frac{Z}{PN}$

(C) $\frac{ZN}{P}$ (D) $\frac{P}{ZN}$

75. The Gears used for connecting two non interesting and non parallel shaft :

(A) Spiral gears (B) Bevel gears

(C) Helical gears (D) Mitre gears

76. The circle on which the involute is generated in spur gear is called :

(A) Clearance circle (B) Pitch circle

(C) Addendum circle (D) Base circle

77. Ornaments are cast by:

(A) Die casting (B) Pressed casting

(C) Gravity casting (D) Continuous casting

78. In centrifugal casting impurities are :

(A) Uniformly distributed

(B) Collected in the centre of casting

(C) Forced outside surface

(D) Collected in the middle section of casting

79. In machine tools, chatter is due to :

(A) Free vibrations (B) Forced vibrations

(C) Self-excited vibrations (D) Cutting vibrations

80. A good lubricant for thread cutting operation is :

(A) Graphite (B) Mineral lard oil

(C) Emulsified oil (D) White lead

81. Tool life is most effected by :

(A) Cutting speed

(B) Tool geometry

(C) Microstructure of material being cut

(D) Feed and depth

82. The machining process in which the metal of work piece is dissolved is :

(A) Chemical machining

(B) Ultrasonic machining

(C) Electro discharge machining

(D) Electro chemical machining

83. The powder metallurgy part has tiny capillary pores all over which can be filled by oil or other lubricant is called :

(A) Repressing

(B) Impregnation

(C) Infiltration

(D) Sintering

84. Increasing the positive back rake angle will make the tool :

(A) Weaker

(B) Smoother

(C) Harder

(D) Stronger

85. A shaft rotating in a bush bearing is an example of :

(A) Sliding fit

(B) Running fit

(C) Rotation fit

(D) Driving fit

86. The following is not a method to find effective thread diameter :

(A) Thread micrometer

(B) Two wire method

(C) The V-piece method

(D) Three wire method

87. The distance from the joint root to the toe of the weld is called :

(A) Leg

(B) Face

(C) Effective throat

(D) Actual throat

88. In solid-state welding the contamination layers between the surfaces to be welded are removed by :

(A) Alcohol

(B) Plastic deformation

(C) Sand blasting

(D) Water jet

89. Which of the following is/are part of Taylor's principles concerned with scientific management?

(i) Ensure cooperation through incentives and provide a work environment that reinforces optimal work results in a scientific manner.

(ii) Divide responsibility for managing and working and devise scientific education and training programmes.

(A) Only (i)
(B) Only (ii)
(C) Both (i) and (ii)
(D) None of the above (i) and (ii)

90. Which of the following is true about a line and staff organization?

(i) The line managers can seek help from specialists by way of advice.

(ii) Staff members have authority and responsibility in a line and staff organisation.

(A) Only (i)
(B) Only (ii)
(C) Both (i) and (ii)
(D) None of the above (i) and (ii)

91. Which of the following is/are used for selective inventory classification?

(i) ABC analysis

(ii) HML analysis

(iii) VED analysis

(iv) FSN analysis

(A) Only (i) and (ii)
(B) Only (ii) and (iv)
(C) None of the above (i), (ii), (iii) and (iv)
(D) All the above (i), (ii), (iii) and (iv)

92. Which of the following is/are correct about duality in Linear Programming?

(i) In the primal is a maximization problem dual will also be a maximization problem.

(ii) The number of primal decision variables equals the number of dual constraints, and the number of primal constraints is equal to the number of dual variables.

(A) Only (i)
(B) Only (ii)
(C) Both (i) and (ii)
(D) None of the above (i) and (ii)

93. Customers arrive at a hospital at the rate of 5/hour (Poisson arrival), and the doctor can serve at the rate of 10/hour(exponential). What is the probability that a customer does not have to wait and walks into the doctors room?

(A) 1.0 (B) 0.5

(C) 0.33 (D) 0.75

94. Which of the following is/are correct in a balanced transportation problem?

(i) Total supply is equal to total demand

(ii) Vogel's approximation method cannot be used for finding a basic feasible solution.

(A) Only (i)

(B) Only (ii)

(C) Both (i) and (ii)

(D) None of the above (i) and (ii)

95. The length of time between placing an order and receipt of items is called :

(A) Re-order level (B) Order Cycle

(C) Inventory Turnover (D) Lead Time

96. Which of the following is/are the assumption/s of Economic Ordering Quantity with instantaneous stock replenishment model (Basic Inventory Model)?

(i) Demand is deterministic

(ii) Lead time is high

(iii) Price of materials is fixed.

(iv) Ordering cost does not vary with order quantity.

(A) Only (i) and (ii)

(B) Only (i), (ii) and (iv)

(C) Only (i), (iii) and (iv)

(D) None of the above (i), (ii), (iii) and (iv)

97. In quality control which of the following is control charts for Attributes?

(A) R Chart (B) P Chart

(C) $\overline{X}$ Chart (D) None of the above

98. Which is the following is/are the advantages of acceptance sampling?

(i) Less expensive than 100 percent inspection

(ii) Where inspection may cause damage or complete destruction acceptance sampling is more useful

(A) Only (i)

(B) Only (ii)

(C) Both (i) and (ii)

(D) None of the above (i) and (ii)

99. Which is the following is/are the advantages of Work Study?

(i) Uniform and improved production flow

(ii) Higher productive efficiency

(A) Only (i)

(B) Only (ii)

(C) Both (i) and (ii)

(D) None of the above (i) and (ii)

100. Which is the following is/are is the purpose of a multiple activity chart?

(i) To detect idle times being enforced on machines and workers

(ii) To optimize work distribution between workers and machines

(iii) To examine the inter-dependency of activities

(A) Only (i) and (ii)

(B) Only (ii)

(C) Only (i) and (iii)

(D) All the above (i), (ii) and (iii)

SPACE FOR ROUGH WORK

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