079/21

Question Booklet Alpha Code

A

A

Question Booklet Sl. No.

Total Number of Questions : 100 **Time : 75 Minutes**

Maximum Marks : 100

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/her 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.

1. Work done in a free expansion process is
   A) Zero
   B) Minimum
   C) Negative
   D) Positive

2. The crystal structure of aluminium is
   A) Body centred cubic
   B) Face centred cubic
   C) Close packed hexagonal
   D) Body centred tetragonal

3. Delta iron occurs in the temperature range of
   A) Room temperature
   B) 600°C to melting point
   C) 800°C to 1200°C
   D) 400°C to 1530°C

4. The number of degree of freedom of an eutectic point in a binary system according to Gibbs phase rule is
   A) 0 B) 1 C) 2 D) 3

5. Which one of the following is the process to refine the grains of metal after it has been destroyed by cold working ?
   A) Annealing
   B) Softening
   C) Recrystalizing
   D) Normalizing

6. The percentage of phosphorus in phosphor bronze is
   A) 0.1 B) 1 C) 11.1 D) 9.8

7. Machining of copper can be improved by adding
   A) Vanadium
   B) Sulphur
   C) Tin
   D) Zinc

8. The Jominy test is used to find
   A) Young's modulus
   B) Hardenability
   C) Yield strength
   D) Thermal conductivity

9. In the polytropic process pv^n = constant, if the value of n is infinity, the process is termed as
   A) Constant volume
   B) Constant pressure
   C) Constant temperature
   D) Adiabatic

10. The specimen in charpy impact test is held as
    A) Cantilever
    B) Simply supported beam
    C) Fixed beam
    D) Hinged beam

11. Dow metal contains
    A) 94% aluminium, 4% copper and 0.5% Mn, Mg, Si and Fe
    B) 92.5% aluminium and 4% copper, 2% nickel and 1.5% Mg
    C) 90% magnesium and 9% aluminium with some copper
    D) 90% aluminium and 90% copper

12. Cast iron contains
    A) 0.2% to 0.4% carbon
    B) 0.4% to 0.7% carbon
    C) 1% to 1.3% carbon
    D) 2% to 4% carbon

13. The range of surface hardness that can be obtained by nitriding is
    A) 1000 to 1100 VPN
    B) 1200 to 1400 VPN
    C) 600 to 800 VPN
    D) 400 to 500 VPN

14. A single jet pelton wheel has head of 500 m and jet dia 200 mm. Determine the discharge through the jet, if KV = 0.98.
    A) 2.4 m^3/s
    B) 3.04 m^3/s
    C) 4.03 m^3/s
    D) 5.92 m^3/s

15. A turbine is to operate under a head of 30m and the discharge is 10 m^3/s. If the turbine efficiency is 0.75. Determine the power generated by the turbine.
    A) 2700 HP
    B) 2800 HP
    C) 2900 HP
    D) 3000 HP

16. Water is flowing through a nozzle fitted at the end of a pipe. The diameter of the nozzle is 0.1m and the head of water at the centre of nozzle is 100 m. Determine the velocity of flow through nozzle if $C_v = 0.95$.
    A) 47.43 m/s
    B) 45.25 m/s
    C) 42.08 m/s
    D) 49.84 m/s

17. The angle of taper of a draft tube is
    A) Less than 8°
    B) Around 10°
    C) Around 15°
    D) More than 10°

18. Reynolds number is the ratio of
    A) Viscous forces to gravity forces
    B) Inertial forces to viscous forces
    C) Viscous forces to inertial forces
    D) Inertial forces to gravity forces

19. Spouting velocity is
    A) Ideal velocity of jet
    B) 50% of ideal velocity of jet
    C) Actual velocity of jet
    D) Velocity of the jet under some specified conditions

20. A Francis turbine working at 300 rpm has a unit speed of 50 rpm. What is the effective head under which this turbine can be operated ?
    A) 16 m
    B) 6 m
    C) 36 m
    D) 60 m

21. The internal energy of an ideal gas is a function of
    A) Temperature and pressure
    B) Volume and pressure
    C) Entropy and pressure
    D) Temperature only

22. Discharge of a centrifugal pump is
    A) Directly proportional to velocity of flow
    B) Inversely proportional to velocity of flow
    C) Directly proportional to square of the velocity of flow
    D) Inversely proportional to square of velocity of flow

23. What will be the ratio of head loss of a laminar incompressible flow in a horizontal circular pipe with average velocity V and pipe diameter D to that with average velocity 2V and pipe diameter D/2 ? The fluid and pipe length are same.
    A) 1
    B) 4
    C) 8
    D) 16

24. The boundary layer thickness of a lamina flow over a flat plate at a distance of 0.25 m from the leading edge is 8 mm. Then what will be the thickness at a distance of 0.75 m ?
    A) 13.85
    B) 15.25
    C) 11.45
    D) 10.15

25. Water hammer in pipes takes place when
    A) Fluid flows with very high velocity
    B) Fluid flows with very high pressure
    C) Flowing fluid is suddenly brought to rest by closing a valve
    D) Flowing fluid is gradually brought to rest by closing a valve

26. Which one is not a rotating machine ?
    A) Gear pump
    B) Centrifugal pump
    C) Jet pump
    D) Vane pump

27. Why a Net Positive Suction Head (NPSH) is required for a hydraulic pump ?
    A) To increase suction head
    B) To increase efficiency
    C) To increase discharge
    D) To prevent cavitation

28. The maximum hydraulic efficiency of an ideal impulse turbine with blade angle A is
    A) (1+cosA)/2
    B) (1–cosA)/2
    C) (1+sinA)/2
    D) (1–sinA)/2

29. The overall efficiency of a Pelton turbine is 70%. What is the hydraulic efficiency if the mechanical efficiency is 80% ?
    A) 82.5%
    B) 87.5%
    C) 85.5%
    D) 86.5%

30. Measurement of temperature is based on
    A) Zeroth law of thermodynamics
    B) First law of thermodynamics
    C) Second law of thermodynamics
    D) Third law of thermodynamics

31. Heat and work are
    A) Intensive properties
    B) Extensive properties
    C) Point functions
    D) Path functions

32. The ratio of C_p/C_v for a gas with n degree of freedom is equal to
    A) 2n+1
    B) 2/(n–1)
    C) 1+(2/n)
    D) (1+2)/n

33. Which of the following is an intensive property of a system ?
    A) Pressure
    B) Mass
    C) Enthalpy
    D) Density

34. Specific internal energy and specific volume of a pure substance under 8MPa and 400°C are 2864 kJ/kg and 0.03432 m^3/kg respectively. What is its specific enthalpy ?
    A) 3138.56 kJ/kg
    B) 3224.46 kJ/kg
    C) 3624.78 kJ/kg
    D) 3016.48 kJ/kg

35. Gibbs free energy G is given by
    A) G = H+TS
    B) G = H – TS
    C) G = H/TS
    D) G = HT/S

36. A diathermic wall permits heat transfer by
    A) Conduction only
    B) Convection only
    C) Radiation only
    D) All the three modes of heat transfer

37. For ductile materials, toughness is the measure of
    A) Resistance to scratching
    B) Resistance to indentation
    C) Ability to absorb energy to fracture
    D) Ability to absorb energy till elastic limit

38. The ultimate tensile strength of mild steel in the engineering stress strain curve refers to
    A) Yield stress
    B) Maximum stress
    C) Proportional limit
    D) Fracture stress

39. A measure of Rockwell hardness is the
    A) Depth of penetration of indenter
    B) Surface area of indentation
    C) Projected area of indentation
    D) Volume of indentation

40. The test for measuring the hardness of thin section is
    A) Vickers hardness test
    B) Charpy test
    C) Knoop hardness test
    D) Herbert cloud burst test

41. Estimate the welding speed for Aluminium (Specific energy 2.9 J/mm^3) when the voltage is 40V and current is 200 A, cross sectional area of weld bead is 30 mm^2 and welding efficiency is 80%.
    A) 67.5 mm/s
    B) 73.6 mm/s
    C) 75.6 mm/s
    D) 85 mm/s

42. Compared with other arc welding processes plasma arc welding has
    A) Better arc stability
    B) Higher energy concentration
    C) Less thermal distortion
    D) All the above

43. SMAW is best suited for workpiece for a whole range of thickness of
    A) 1 – 15 mm
    B) 7 – 25 mm
    C) 3 – 19 mm
    D) 15 – 25 mm

44. Range of currents employed in SAW process single arc process is
    A) 300 – 2000 A
    B) 700 – 3800 A
    C) 1200 – 5000 A
    D) 600 – 4000 A

45. For electron beam welding, which of the following are used ?
    A) Shielded gas
    B) Flux
    C) Vacuum
    D) None of the above

46. Sonotrode in ultrasonic welding does the function of
    A) Apply shear stress
    B) Coupling between transducer and tip
    C) Removing contaminants
    D) None of the above

47. Weld zone size and shape in friction welding is influenced by
    A) Amount of heat generated
    B) Thermal conductivity of material
    C) Axial pressure
    D) All the above

48. Find the heat dissipated by resistance welding of a 1mm thick workpiece if heat required to melt the weld nugget is 380 J for a current of 5000 A and resistance 200 μA and contact period of 0.1 S.
    A) 400 J
    B) 120 J
    C) 198 J
    D) 500 J

49. In percussion welding the power is discharged within a span of
    A) 1 – 10 mS
    B) 1 – 10 μS
    C) 10 – 200 mS
    D) None of the above

50. In explosive welding the detonation speed is a function of
    A) Explosive type
    B) Packing density of explosive
    C) Both A) and B)
    D) None of the above

51. Which of the following is not a rolling defect ?
    A) Waviness
    B) Alligatoring
    C) Cracks
    D) Blow holes

52. Which of the following does not need additional finishing process ?
    A) Hot rolling
    B) Hot forging
    C) Cold rolling
    D) Cold forging

53. Forging defects of a component can cause
    A) Fatigue failures
    B) Wear and corrosion
    C) Both A) and B)
    D) None of the above

54. Which of the following is not an advantage of cold extrusion over hot extrusion process ?
    A) Improved surface finish
    B) Less tooling stresses
    C) Competitive production rates
    D) Better control of dimensional tolerances

55. Which of the following do not influence quality and surface finish in drawing ?
    A) Die design
    B) Lubricants
    C) Reduction per pass
    D) None of the above

56. Isentropic work done by a gas turbine is
    A) Less than actual work
    B) Greater than actual work
    C) Equal to actual work
    D) Depends on the cycle

57. For a multi-stage reciprocating compressor, work consumed is less in the case of
    A) Isothermal compression process
    B) Adiabatic compression process
    C) Both A) and B)
    D) None of the above

58. According to Fourier's law Heat transfer increases proportional to increase in
    A) Cross-section area
    B) Temperature difference
    C) Temperature gradient
    D) All the above

59. Three metal walls of same cross-sectional area and conductivity ratio 1 : 2 : 4 transfer heat at Q kJ/hr. If the walls are of same thickness, the temperature drops will be in the ratio
    A) 1 : 2 : 4
    B) 1 : 1 : 1
    C) 4 : 2 : 1
    D) None of the above

60. Methods to improve Brayton cycle efficiency are
    A) Regeneration
    B) Reheating
    C) Intercooling
    D) All the above

61. Factors affecting auto ignition in an engine are
    A) Richness of charge
    B) Inlet temperature
    C) Both A) and B)
    D) None of the above

62. The numbers used in free convection calculations of fluids are
    A) Grashoff, Prandtl
    B) Reynold, Prandtl
    C) Mach, Reynold
    D) Mach, Grashoff

63. The basic law of convection is
    A) Fourier's law
    B) Planck's law
    C) Newton's law
    D) Stefan-Boltzmann law

64. The peak wavelength of radiation emitted by a black body at a temperature of 2000 K is 1.45 μm. If the peak wavelength of emitted radiation changes to 2.90 μm, then the temperature (in K) of the black body is
    A) 500
    B) 1000
    C) 2000
    D) 3000

65. Consider an ideal vapor compression refrigeration cycle. If the throttling process is replaced by an isentropic expansion process, keeping all the other processes unchanged, which one of the following statements is true for the modified cycle ?
    A) Coefficient of performance is the same as that of the original cycle
    B) Coefficient of performance is lower than that of the original cycle
    C) Coefficient of performance is higher than that of the original cycle
    D) Refrigerating effect is lower than that of the original cycle

66. Which one of the following statements is correct for a superheated vapour ?
    A) Its pressure is less than the saturation pressure at a given temperature
    B) Its temperature is less than the saturation temperature at a given pressure
    C) Its volume is less than the volume of the saturated vapour at a given temperature
    D) Its enthalpy is less than enthalpy of the saturated vapour at a given pressure

67. Which one of the following is a CFC refrigerant ?
    A) R744 B) R290
    C) R502 D) R718

68. Which of the following has consistent effect on improving COP of simple refrigerating cycle ?
    A) Undercooling B) Superheating
    C) Both A) and B) D) None of the above

69. According to Buckingham's Pi theorem, the number of dimensionless groups to define a problem equals
    A) Total number of variables
    B) Fundamental dimensions
    C) Difference between total number of variables and fundamental dimensions
    D) None of these

70. Which is not true about steam jet refrigeration ?
    A) It uses water as refrigerant B) It can be used below 0°C
    C) Can be used in breweries D) None of the above

71. Two elements when joined in such a manner that the relative motion between them is completely constrained is called
    A) Structure
    B) Machine
    C) Kinematic pair
    D) Mechanism

72. Which is the Kinematic Inversion of double slider crank chain ?
    A) Elleptical Trammel
    B) Scotch Yoke
    C) Oldham's Coupling
    D) All of the above

73. Mobility of a statically indeterminate structure is
    A) ≤ -1
    B) 0
    C) 1
    D) ≥ 2

74. Universal joint is an example of
    A) Lower pair
    B) Higher pair
    C) Rolling pair
    D) Sliding pair

75. The Davis steering gear is not used because
    A) It has turning pairs
    B) It has rolling pairs
    C) It has sliding pairs
    D) It does not fulfill condition of correct gearing

76. For maximum power transmission maximum belt tension T_{max} is related to centrifugal Tension T_c as
    A) $\frac{T_c}{3}$
    B) $\frac{T_c}{4}$
    C) $2T_c$
    D) $3T_c$

77. In case of involute gears which of the following statement is correct ?
    A) Interference is inherently absent
    B) Variation in centre distance of shafts increases radial force
    C) A convex flank is always is contact with concave flank
    D) Pressure angle is constant throughout the teeth engagement

78. Choose the correct statement for safe design.
    A) For power lost in friction uniform wear is assumed.
    B) For power lost in friction uniform pressure is assumed.
    C) For power transmitted due to friction uniform pressure is assumed.
    D) For power transmitted due to friction or lost in friction uniform wear is assumed.

79. If effective tension of belt drive increased by 20%, on both tight side and slackside of belt drive tension is 36, then the power transmitted is
    A) 12 kW
    B) 10 kW
    C) 8 kW
    D) not possible to find with this data

80. Tooth interference in an external involute spur gear pair can be reduced by
    A) Decreasing centre distance between gear pair
    B) Decreasing module
    C) Decreasing pressure angle
    D) Increasing number of gear teeth

81. For power transmission commonly used tooth profile in gear drives are
    A) A cycloid
    B) An involute
    C) An ellipse
    D) A parabola

82. Which of the following is classified as transmission dynamometer ?
    A) Torsion dynamometer
    B) Froude's hydraulic dynamometer
    C) Prony brake dynamometer
    D) Belt dynamometer

83. The pressure angle for spur gears is kept small
    A) To increase the force for power transmission in gears
    B) To reduce the axial thrust on bearings on which gears are mounted
    C) Both A) and B)
    D) None of the above

84. Gear train used in clocks is
    A) Simple gear train
    B) Reverted gear train
    C) Sun and planet gear
    D) Differential gear

85. Axial thrust is minimum in case of
A) Spur gears
B) Double helical gears
C) Bevel gears
D) Mitre gears

86. For resistance spot welding of 1.5 mm thick steel sheet current required is on the order of
A) 10 A
B) 10000 A
C) 100 A
D) 1000 A

87. The coupling used to connect two shafts with large angular misalignment is
A) Flange coupling
B) Hook's joint
C) An Oldham's coupling
D) Flexible bush coupling

88. In the assembly design of shaft, pulley and key the weakest member is
A) Pulley
B) Key
C) Shaft
D) None

89. For manufacturing pipes which carry gas, what are the joining processes employed as listed below ?
1) Rivetting
2) Welding
3) Bolts and Nuts
A) 1 and 2
B) 2 alone
C) 1 and 3
D) 1, 2 and 3

90. A helical spring has 'n' number of turns, Coil Diameter 'D' a second spring made of same wire diameter and of same material has $\frac{'n'}{2}$ turns of diameter of 2D. If the stiffness of first spring is 'K' then stiffness of second spring is
A) $K/2$
B) $K/4$
C) 2K
D) 4K

91. Minimum number of teeth on a pinion of 20° full depth system without interference is
A) 17
B) 31
C) 14
D) 12

92. For transmitting power in both direction screw thread adopted is
A) Multiple thread
B) Square thread
C) Buttress thread
D) Acme thread

93. In a rigid flanged coupling connecting two shafts transmitting power, bolts in coupling are subjected to
A) Shear force and bending moment
B) Axial force
C) Torsion
D) Torsion and bending moment

94. When a load of 10 kN is applied on ball bearing, life of bearing is 8000 hours. If the load is increased to 20 kN keeping all other conditions same, life of bearing will be
A) 4000 B) 2000 C) 1000 D) 500

95. Distance between the centre lines of two rows of rivets is called
A) Back pitch
B) Gauge distance
C) Gauge line
D) Pitch

96. Which type rivet head is used for the boiler plate riveting ?
A) Pan head
B) Conical head
C) Counter sunk head
D) Snap head

97. Lewis equation is applied
A) Only to pinion
B) Only to gear
C) To weaker of the pinion and gear
D) To stronger of the pinion and gear

98. Radius of friction circle in journal bearing increases with increase in
A) Load
B) Speed of journal
C) Viscosity of lubricant
D) Radius of journal

99. In an involute gear of pressure angle 'ϕ' the ratio of pitch circle radius to base circle radius is
A) $\sin\phi$
B) $\sec\phi$
C) $\cos\phi$
D) $\operatorname{cosec}\phi$

100. When shafts axes are at offset which type of gears are used ?
A) Mitre gears
B) Spiral bevel gears
C) Hypoid gears
D) Zerol gears

Space for Rough Work