005/2021

Question Booklet
Alpha Code

A

Question Booklet
Serial Number

Total No. of Questions : 100 **Time : 75 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. Blank sheets of paper is attached to the question booklet. These 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.

005/2021-A

<div align="center">

Total Marks : 100 Marks
</div>

<div align="right">

Time : 1 hour and 15 minutes
</div>

1. If $A = \begin{bmatrix} 2 & -1 \\ -3 & 2 \end{bmatrix}$, then $(A^{-1})^T$ is given by

   (A) $\begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$

   (B) $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$

   (C) $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$

   (D) $\begin{bmatrix} 2 & -3 \\ 1 & 2 \end{bmatrix}$

2. Which of the following is a solution of the system of equations given by

   $3x + y + 2z = 3$
   $2x - 3y - z = -3$
   $x + 2y + z = 4$

   (A) $x = 2, y = 1, z = -2$

   (B) $x = 1, y = -2, z = 1$

   (C) $x = 1, y = 2, z = -1$

   (D) $x = 2, y = 2, z = -1$

3. Coefficient of xy^3 in the expansion of $(2x - 3y)^4$ is

   (A) 216

   (B) −96

   (C) 96

   (D) −216

4. The value of $\sin 51° + \cos 81°$ is given by

   (A) $\cos 21°$

   (B) $\cos 30°$

   (C) $\sin 21°$

   (D) $\sin 30°$

5. The equation of the line that is parallel to the line $2x + 5y = 7$ and passing through the mid point of the line joining $(2, 7)$ and $(-4, 1)$ is

   (A) $2x + 5y - 18 = 0$

   (B) $2x + 5y + 18 = 0$

   (C) $2x + 5y + 22 = 0$

   (D) $2x + 5y - 22 = 0$

6. The maximum value of $\dfrac{\log x}{x}$ is at

   (A) $x = 1$

   (B) $x = \dfrac{1}{e}$

   (C) $x = \dfrac{1}{e^2}$

   (D) $x = e$

7. If m is an integer, then the value of $\int_0^\pi \sin^2 mx \, dx$ is given by

    (A)   0   (B) $\dfrac{\pi}{2}$

    (C) π (D)   1

8. The equation of the straight line through (2, 3) and making equal intercepts on the axes is given by

    (A) $x + y = 1$ (B) $x + y = 3$

    (C) $x + y = 2$ (D) $x + y = 5$

9. The area bounded by the rectangular hyperbola $xy = c^2$ and the x-axis from $x = \pi$ to $x = 2\pi$ is

    (A) $c^2 \pi$ (B) $c^2 \log 2$

    (C) $c^2 \log \pi$ (D) $c^2 \log 2\pi$

10. Solution of the differential equation $\sin x \dfrac{dy}{dx} + y \cos x - 1 = 0$ is

    (A) $y \sin x = x + C$ (B) $y \cos x = x + C$

    (C) $y(1 - \sin x) = x + C$ (D) $y(1 - \cos x) = x + C$

11. The principle of work from whole to part in surveying is to ensure that
    (A)   survey work may be completed quickly.
    (B)   plotting shall be easier and correct.
    (C)   instrumental errors will be less.
    (D)   errors of one portion does not affect other.

12. In levelling, a station is a point, where
    (A)   levelling staff is placed   (B)   dumpy level is set up
    (C)   bench mark is not given   (D)   ranging rod is placed

13. Separation of water on fresh concrete is known as
    (A)   hydration   (B)   segregation
    (C)   bleeding   (D)   creep

14. The unique property of steel by virtue of which can be drawn into thin wires is called
    (A)   malleability   (B)   ductility
    (C)   toughness   (D)   softness

15. Finishing mortar joints after completion of masonry wall is known as

    (A) jointing   (B) pointing

    (C) coping   (D) racking

16. Pelton wheel turbine is :

    (A) Radial flow turbine   (B) Axial flow turbine

    (C) Tangential flow turbine   (D) Mixed flow turbine

17. How many valves are there in a two stroke engine ?

    (A) 1   (B) 3

    (C) 2   (D) None of these

18. The most common balanced engine firing order for a six cylinder in line engine is :

    (A) 1-3-6-4-2-5   (B) 1-5-3-2-4-6

    (C) 1-5-3-6-4-2   (D) 1-5-3-6-2-4

19. When the clutch is engaged, the spring pressure clamps the friction plate between the pressure plate and

    (A) Flywheel   (B) Differential

    (C) Clutch pedal   (D) Reaction plate

20. The thermodynamic cycle used in a steam turbine based thermal power plant

    (A) Brayton cycle   (B) Rankine cycle

    (C) Combined cycle   (D) Carnot cycle

21. A 10V supply is applied across a 5 ohm resistor. The current and power will be

    (A) 50 A, 500W   (B) 2A, 10W

    (C) 2A, 20W   (D) 0.5A, 5W

22. In a resistance network ABC a 2 ohm resistor is connected from A to B, two resistors 6 ohm and 3 ohm both connected between B and C and a 4 ohm resistor between A and C. The effective resistance between A and C will be

    (A) 15 ohms   (B) 2 ohms

    (C) 0.8 ohms   (D) 4 ohms

23. The electrical energy consumption of a domestic consumer is measured in

    (A) Ampere   (B) MWh

    (C) Volt   (D) kWh

24. An RLC series circuit has a resistance of 12 ohms inductive reactance of 7 ohms and capacitive reactance of 2 ohms. The effective impedance of the circuit is

    (A) 21 ohms   (B) 13 ohms

    (C) 15 ohms   (D) 17 ohms

25. The device which gives protection from electrical shock is

    (A) RCCB   (B) MCB

    (C) Fuse   (D) Lightening Arrestor

26. The minimum voltage required to establish regulation in 7805 IC is

    (A) 5 V   (B) 5.6 V

    (C) 7.3 V   (D) 10 V

27. A solid state relay uses the following for electrical isolation

    (A) Flywheel diode   (B) Opto coupler

    (C) Snubber circuit   (D) Electromagnet

28. Size of RAM and ROM in 8051 microcontroller is

    (A) 128 bytes & 4 K bytes   (B) 128 bytes & 8 K bytes

    (C) 64 bytes & 4 K bytes   (D) 64 bytes & 8 K bytes

29. The CDMA reverse channel employs the following modulation technique.

    (A) BPSK   (B) QPSK

    (C) BFSK   (D) OQPSK

30. Which of the following UPS has highest efficiency ?

    (A) Standby   (B) Standby on-line hybrid

    (C) Standby Ferro   (D) Double conversion online

31. _____ mechanism operating on the upstroke of a press, which ejects workpiece on blanks from a press tool.
    (A) Cushion
    (B) Bolster plate
    (C) Ram
    (D) Knockout

32. Pilots are heat treated to a hardness of HRC
    (A) $57 - 60$
    (B) $20 - 25$
    (C) $100 - 130$
    (D) $90 - 93$

33. In a progressive die, the tonnage of a press can be reduced by
    (A) Increasing hardness of the die
    (B) Increasing punch hardness
    (C) Grinding the cutting edges
    (D) Staggering the punches

34. A moving mandrel is used in
    (A) Wire drawing
    (B) Tube drawing
    (C) Centrifugal casting
    (D) Nibbling

35. In blanking the clearance provided is
    (A) 50% on punch and die
    (B) 25% on punch and 75% on die
    (C) On punch
    (D) On die

36. Metal extrusion is generally used for producing
    (A) Uniform solid section
    (B) Uniform hollow section
    (C) Uniform hollow and solid section
    (D) Varying section

37. Blanking and punching operations can be performed simultaneously on
    (A) Combination die
    (B) Compound die
    (C) Progressive die
    (D) Simple die

38. The rivet hole diameter for a rivet having diameter 14 is
    (A) 14.2
    (B) 14.5
    (C) 15
    (D) 15.5

39. Injection moulding is a process used for processing
    (A) Aluminium
    (B) Nickel
    (C) Steel
    (D) Plastics

40. Thermoplasts are joined by process called
    (A) USW
    (B) SAW
    (C) FW
    (D) LBW

41. In cold chamber diecasting process only non-ferrous alloys with _____ melting point are cast.
    (A) low
    (B) medium
    (C) high
    (D) all

42. The bottles from thermoplastic materials are made by
    (A) Compression moulding
    (B) Extrusion
    (C) Injection moulding
    (D) Blow moulding

43. Addition of magnesium to cast iron increases its
    (A) Ductility and strength   (B) Hardness
    (C) Creep strength   (D) Fatigue strength

44. Chills are used in moulds to
    (A) Achieve directional solidification   (B) reduce blow holes
    (C) reducing freezing time   (D) smooth metal flow

45. Hot chamber process is suitable to cast
    (A) Iron   (B) Nickel
    (C) Plastic   (D) Tin

46. The process used to reduce hardness of steel is
    (A) Baking   (B) Annealing
    (C) Tempering   (D) Quenching

47. In MS the percentage of carbon is ranging from
    (A) $0.05 - 0.30$ (B) $0.20 - 0.35$
    (C) $0.35 - 0.50$ (D) $0.45 - 0.60$

48. The 18 : 4 : 1 tool steel is
    (A) Martensite   (B) HSS
    (C) Austenite   (D) Bainite

49. Deoxidising agent for steel is
    (A) Chromium   (B) Nickel
    (C) Manganese   (D) Tungsten

50. Copper is added in steel for improving
    (A) hardness   (B) atmospheric corrosion
    (C) hot hardness   (D) ductility

51. Toughness of a material is measured by means of
    (A) Joniney quench test   (B) Rock well test
    (C) Impact testing   (D) Vickers test

52. From the following identify the extreme hardened steel.
    (A) Martensitic   (B) Pearlitic
    (C) Ladeburitic   (D) Austenitic

53. $VT^n = C$ is _____ tool life equation
    (A) Taylor   (B) Stephen
    (C) Chapman   (D) Johsons

54. The temperature of carburising flame in gas welding is _____ that of oxidising flame
    (A) lower   (B) higher
    (C) equal   (D) unrelated

55. Fluxes are used while welding
- (A) To increase the rate of welding
- (B) To clean joint
- (C) Prevent oxidation
- (D) All of the above

56. In reaming process
- (A) Metal removal rate is high
- (B) High surface finish
- (C) Form accuracy is obtained
- (D) High dimensional accuracy obtained

57. With reference to NC machine which of the following statement is wrong ?
- (A) Closed loop control system using.
- (B) Open loop control system using.
- (C) Post processor is an item of hardware.
- (D) Paper tape is a part of machine

58. In a single point turning operation of steel, with a cementide carbide tool, Taylor tool life exponent is 0.25. If the cutting speed is halved, the tool life will increase by
- (A) 2 times
- (B) 4 times
- (C) 8 times
- (D) 16 times

59. Liner and slip bushes are a part of
- (A) Milling fixture
- (B) Drill Jigs
- (C) Turning fixture
- (D) Welding fixture

60. T-T-T diagram indicates time, temperature, transformation of
- (A) Cenentite
- (B) Pearlite
- (C) Ferrite
- (D) Austenite

61. Machine tool guide ways are usually hardened by
- (A) Flame hardening
- (B) Induction hardening
- (C) Cyaniding
- (D) Nitriding

62. Plug gauges are used to check
- (A) Threads
- (B) Holes
- (C) Outer diameter
- (D) Angles

63. Micrometers are calibrated with
- (A) Vernier caliper
- (B) Snap gauges
- (C) Feeler gauges
- (D) Slip gauges

64. Sine bar is used to measure
- (A) Angles
- (B) Length
- (C) Thread pitch
- (D) Hole depth

65. Talisurf is to measure
- (A) Magnetism
- (B) Surface finish
- (C) Accuracy of hole
- (D) Strength of steel

66. Arrange the given materials in increasing order of their Young's modulus of elasticity :

    (i)   Stainless Steel;

    (ii)   Tungsten Carbide;

    (iii) Aluminium;

    (iv) Cast Iron

    (A)   (i) (iii) (ii) (iv)

    (B)   (iv) (ii) (i) (iii)

    (C)   (iii) (iv) (i) (ii)

    (D)   (iii) (i) (iv) (ii)

67. A steel bar 1m long and 20 mm × 10 mm cross-section is subjected to a tensile load of 10 kN along its longitudinal axis. If the modulus of elasticity is 2×10^5 N/mm^2 and Poisson's ratio is 0.3, the lateral strain is:

    (A) 0.05×10^{-3} (B) 0.075×10^{-3}

    (C) 0.25×10^{-4} (D) 0.025×10^{-4}

68. Which of the following statements is not true about static friction ?

    (A)   The force of friction depends upon the roughness of the surfaces.

    (B)   The direction of limiting frictional force is opposite to the direction of motion.

    (C)   The magnitude of the limiting friction bears a constant ratio to the normal reaction between the two surfaces.

    (D)   The force of friction is dependent on the area of contact between the two surfaces.

69. The section modulus for a beam of circular section with diameter 'd' is:

    (A) $\dfrac{\pi d^3}{32}$ (B) $\dfrac{\pi d^3}{64}$

    (C) $\dfrac{\pi d^4}{32}$ (D) $\dfrac{\pi d^4}{64}$

70. A weld made to hold parts of a weldment in proper alignment until the final welds are made is called

    (A)   Filled weld   (B)   Kerf

    (C)   Nugget   (D)   Tack weld

71. In case of a circular shaft, the torque divided by the angle of twist per unit length is called

    (A)   torsional stiffness   (B)   torsional rigidity

    (C)   polar modulus   (D)   torsional strain

72. Given that the pressure is 3 kg/cm^2, the equivalent height of water column is
    (A) 30 m
    (B) 3 cm
    (C) 10 m
    (D) 1 cm

73. When the metacentre is lower than the centre of gravity of the floating body, the body is said to be in a state of
    (A) Stable equilibrium
    (B) Neutral equilibrium
    (C) Unstable equilibrium
    (D) None of these

74. An imaginary line in the fluid, the tangent to which at any point gives the direction of motion at that point is termed as
    (A) Path line
    (B) Equipotential line
    (C) Filament line
    (D) Stream line

75. If the density and the specific volume of the fluid does not change during the flow, the flow is called
    (A) Streamline flow
    (B) Incompressible flow
    (C) Steady flow
    (D) Irrotational flow

76. Which of the following statements is not true in case of a venturimeter ?
    (A) In convergent section, fluid velocity increases and static pressure decreases.
    (B) The length of the divergent section is larger than that of the convergent section
    (C) The maximum cone angle of the diverging area is more than that of the converging area
    (D) The diameter of the throat area is kept constant

77. If 'θ' is the angle of a triangular notch in degree, 'C_d' is the coefficient of discharge, 'g' the acceleration due to gravity and 'H' represents the height of the liquid above the apex of the notch, the discharge over the notch is given by
    (A) $\dfrac{8}{15}C_d\sqrt{2g}\tan\dfrac{\theta}{2}H^{5/2}$
    (B) $\dfrac{8}{15}C_d\sqrt{2g}\tan\dfrac{\theta}{2}H^{3/2}$
    (C) $\dfrac{8}{15}C_d\sqrt{2g}\sin\dfrac{\theta}{2}H^{3/2}$
    (D) $\dfrac{8}{15}C_d\sqrt{2g}\sin\dfrac{\theta}{2}H^{5/2}$

78. The head loss due to friction in a pipe of 1m diameter and 10km long in which the water is flowing at a velocity of 1 m/s is _____ (Take coefficient of friction as 0.005 and 'g' as 10 m/s^2).
    (A) 15 m
   (B) 5 m
    (C) 20 m
    (D) 10 m

79. Which of the following types of casings are used to enclose the impeller in a centrifugal pump ?

    (A) Volute casing

    (B) Vortex casing

    (C) Volute casing with guide blades

    (D) All of these

80. The theoretical and actual discharge of a reciprocating pump are 200 litres/min. and 190 litres/min. respectively. The slip of the pump is

    (A) 10%   (B) 5%

    (C) 5.26%   (D) 1.05%

81. Which of the following types of turbines is used under a head of 200m and the specific speed of 30 rpm ?

    (A) Francis turbine   (B) Kaplan turbine

    (C) Pelton wheel   (D) None of these

82. Which of the following is a device used in hydraulic systems to store pressure energy and reduce pulsations ?

    (A) Hydraulic accumulator   (B) Hydraulic Intensifier

    (C) Hydraulic torque converter   (D) Hydraulic coupling

83. 'Lack of specialization' is a major limitation of the following type of organization structure

    (A) Line organization

    (B) Line and Staff organization

    (C) Functional Organization

    (D) Line, Staff and Committee Organization

84. Select the option which correctly matches the following :

    (a) Nominal wage   (i)   wages adjusted for inflation

    (b) Fair wage   (ii)   also called money wage

    (c) Minimum wage   (iii) Minimum wage rate for specific occupations

    (d) Real wage   (iv) Lowest wage employers can legally pay

    Codes :

    (A) a-iv, b-iii, c-ii, d-i

    (B) a-ii, b-iii, c-iv, d-i

    (C) a-iii, b-i, c-iv, d-ii

    (D) a-i, b-iv, c-ii, d-iii

85. Which of the following is the main focus of Total Quality Management ?

    (A) Customer   (B) Process

    (C) People   (D) All of these

86. In PERT, the activity duration is assumed to have the following distribution

    (A) Normal   (B) Gamma

    (C) Beta   (D) Erlang

87. The difference between the Latest finish time of activity under consideration and the Earliest start time of the following activity is called

    (A) Interfering float   (B) Free float

    (C) Total float   (D) Independent float

88. In LPP, if one of the basic variables takes on a zero value, then the basic feasible solution is called

    (A) Unbounded solution   (B) Degenerate solution

    (C) Non-degenerate solution   (D) Infinite solution

89. Which of the following methods is not used for obtaining the initial basic feasible solution of a transportation problem ?

    (A) Nort-West Corner method   (B) Least Cost method

    (C) Modified-Distribution method   (D) Vogel's Approximation method

90. Consider the following payoff matrix for a game.

Player A	Player B		
	B1	**B2**	**B3**
A1	−1	1	−2
A2	5	3	−6

The saddle point of the game is

    (A) 1   (B) −1

    (C) 3   (D) −2

91. A record showing receipt, issue and physical balance of materials along with maximum and minimum quantity to be held in stock and re-order level is called

    (A) Bill of material   (B) Bin Card

    (C) Master schedule   (D) Break-even chart

92. The production system which is characterized by small production lot size and high product variety is

    (A) Job order production   (B) Mass production

    (C) Flow production   (D) Batch order production

93. A product produced by a firm is sold for ₹ 10 per unit. The fixed cost of the assets is ₹ 60000 with a variable cost of ₹ 4 per unit. The number of units to be produced to reach break-even is

    (A) 5000   (B) 6000

    (C) 10000   (D) 4000

94. Identify the therblig indicated by the symbol ⌗

    (A) Select   (B) Assemble

    (C) Hold   (D) Release load

95. Which of the process chart symbols indicates 'storage' ?

    (A) ⇦   (B) ○

    (C) □   (D) ∆

96. Which of the following rule does not form a part of principles of motion economy ?

    (A) Both hands should be used for productive work.

    (B) Movements of hands or arms should be simultaneous, symmetrical and opposite.

    (C) The work pieces and work place should not have color contrast.

    (D) Two or more tools should be combined if possible.

97. Which among the following control charts is used for variables ?

    (A) R-chart   (B) c-chart

    (C) p-chart   (D) u-chart

98. For an asymmetrical distribution, the relationship between mean, median and mode is given by

    (A) Median = 2 Mean – Mode   (B) Mode = 3 Median – 2 Mean

    (C) Mean = 3 Median – 2 Mode   (D) Mean = 2 Median – Mode

99. With reference to the Euler's equation for crippling load, the relation between effective length (L) and actual length (l) for the column with one end fixed and other end hinged is

    (A) $L = l$ (B) $L = 2l$

    (C) $L = \dfrac{l}{2}$ (D) $L = \dfrac{l}{\sqrt{2}}$

100. The hydraulic circuit in which the flow control valve is used to divert the fluid to the reservoir is

    (A) Meter-in control circuit   (B) Meter-out control circuit

    (C) Bleed-off control circuit   (D) Sequence circuit

SPACE FOR ROUGH WORK

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