

170/2025

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.

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1. Sum of Eigen values of $\begin{bmatrix} 3 & 2 & 4 \\ 0 & 2 & 7 \\ 0 & 0 & 5 \end{bmatrix}$ is :
- (A) 5 (B) 6
(C) 10 (D) 8
2. What is the value of k , the system of equations $x + y + 3z = 0$, $4x + 3y + kz = 0$, $2x + y + 2z = 0$ have a non trivial solution?
- (A) 3 (B) 10
(C) 4 (D) 8
3. The Area of the region bounded by the curves $y^2 = y - x$ and $x + y = 0$ is :
- (A) $\frac{8}{3}$ (B) $\frac{4}{3}$
(C) $\frac{2}{3}$ (D) $\frac{1}{3}$
4. The general solution of the differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$ is :
- (A) $y = (A + Bx)e^{2x}$ (B) $y = (A + Bx)e^{-2x}$
(C) $y = (A \cos 2x + B \sin 2x)$ (D) $y = (A \cos 2x - B \sin 2x)$
5. What is the value of $\frac{\partial w}{\partial v}$ when $u = 0$, $v = 0$ if $w = x^2 + \frac{y}{x}hx = u - 2v + 1$ and $y = 2u + v - 2$?
- (A) 9 (B) -1
(C) -2 (D) 8
6. The general solution of the differential equation $x^2y'' - 7xy' + 16y = 0$ is :
- (A) $y(x) = C_1e^{4x}$ (B) $y(x) = C_1x^{-4} + C_2x^{-4} \ln x$
(C) $y(x) = C_1e^{4x} + C_2xe^{4x}$ (D) $y(x) = C_1x^4 + C_2x^4 \ln x$

7. Solution of $\frac{\partial^2 x}{\partial x \partial y} = x^2 y$ subject to the condition $z(x, 0) = x^2$ and $z(1, y) = \cos y$ is :
- (A) $z = \cos y + x^2$ (B) $z = \cos y + x^2 y$
 (C) $z = \frac{1}{6} x^3 y^2 + \cos y - \frac{1}{6} y^2 - 1 + x^2$ (D) $z = \frac{1}{6} x^3 y^2 + \sin y - \frac{1}{6} y^2 + x^2$
8. The order of convergence of Newton Raphson method is :
- (A) 0 (B) 1
 (C) 2 (D) 3
9. Newton-Gregory Forward interpolation formula can be used :
- (A) only for unequally spaced intervals
 (B) only for equally spaced intervals
 (C) for both equally and unequally spaced intervals
 (D) for unequally intervals
10. A wireframe model represents a solid using :
- (A) Faces only (B) Curves and points only
 (C) Surface with normals (D) Edges, vertices and curves
11. For a screw jack with mean radius r , pitch p and friction coefficient μ , the efficiency increases when :
- (A) μ increases (B) p decreases
 (C) friction angle ϕ decreases (D) helix angle α decreases
12. A wedge is pushed under a block very slowly, The block moves up.
 Friction on the block from the wedge is:
- (A) Up the plane (B) Down the plane
 (C) Horizontal (D) Zero
13. For V-belt drives, the frictional holding capacity increases due to :
- (A) Pulley diameter (B) Groove angle
 (C) Belt speed (D) Belt thickness
14. The load torque in an electrical drive generally :
- (A) Always remains constant
 (B) Depends only on speed
 (C) Depends on speed and load nature
 (D) Its independent of speed

15. For an induction motor drive, slip becomes negative during :
 (A) Starting (B) Plugging
 (C) Regenerative braking (D) Motoring
16. For a centrifugal pump operating at constant speed, if impeller diameter is increased by 10%, the head developed increases approximately by :
 (A) 10% (B) 21%
 (C) 33% (D) 46%
17. Hydraulic efficiency is connected with :
 (A) Leakage losses
 (B) Bearing losses
 (C) Electrical
 (D) Losses Impeller friction and eddy losses
18. Compared to centrifugal pumps, screw pumps have :
 (A) Much lower NPSH_{required} (B) Much higher NPSH_{required}
 (C) Same NPSH_{required} (D) No cavitation issues
19. Which motion profile gives zero jerk start and end?
 (A) Simple harmonic motion
 (B) Constant acceleration-deceleration
 (C) Cycloidal motion
 (D) Uniform motion
20. High-performance crankshafts are typically :
 (A) Forged medium-carbon steel (B) Nodular (spheroidal) cast iron
 (C) Cast iron (D) Bronze alloy
21. For a centrifugal pump, the head-discharge curve typically is :
 (A) Head increases with discharge
 (B) Head decreases with discharge
 (C) Head remains constant with discharge
 (D) Head first increases then decreases
22. The slope of a system curve is proportional to :
 (A) Q (B) Q^2
 (C) $1/Q$ (D) $1/Q^2$
23. For a pump running at constant diameter, doubling the RPM will change the developed head by :
 (A) 2 times (B) 4 times
 (C) 8 times (D) 16 times

24. A fan load has torque proportional to :
- (A) Constant torque (B) $T \propto \omega^2$
 (C) $T \propto \omega^3$ (D) $T \propto \omega$
25. For a DC shunt motor, the natural speed-torque curve is :
- (A) Nearly horizontal (B) Steeply rising
 (C) Parabolic (D) Hyperbolic
26. Reynolds number is represented as the ratio of inertia force to :
- (A) Pressure force (B) Viscous force
 (C) Gravity force (D) Surface tension force
27. For an incompressible viscous flow between parallel plates, the velocity distribution due to pressure gradient is :
- (A) Linear (B) Parabolic
 (C) Logarithmic (D) Exponential
28. The momentum equation for a control volume is based on :
- (A) Conservation of energy (B) Conservation of mass
 (C) Newton's second law of motion (D) First law of thermodynamics
29. For irrotational flow, the vorticity is :
- (A) Zero (B) Constant
 (C) Infinite (D) Equal to velocity
30. The velocity potential function ϕ satisfies which of the following equations?
- (A) Poisson's equation (B) Laplace's equation
 (C) Navier-Stokes equation (D) Bernoulli's equation
31. The CGS unit of kinematic viscosity is :
- (A) Poise (B) Pascal-second
 (C) Stoke (D) $\text{N}\cdot\text{m}^2/\text{kg}$
32. Bernoulli's equation is derived from :
- (A) Newton's first law (B) Law of momentum conservation
 (C) Law of mass conservation (D) Law of energy conservation
33. For a fillet weld subjected to transverse loading, the maximum stress occurs :
- (A) At the toe of the weld (B) At the throat section
 (C) At the weld root (D) Along the weld leg

34. The sum of pressure head and potential head is termed as :
 (A) datum head (B) velocity head
 (C) piezometric head (D) static head
35. The throat thickness of a fillet weld is :
 (A) Equal to the leg length (B) 0.707 times the leg length
 (C) 1.414 times the leg length (D) Half the leg length
36. The maximum shear stress theory is also called :
 (A) Rankine theory (B) Mohr's theory
 (C) Von Mises theory (D) Tresca theory
37. The modulus of resilience is the area under the stress-strain curve up to :
 (A) Yield point (B) Ultimate point
 (C) Fracture point (D) Proportional point
38. The ability of a material to absorb energy up to fracture is :
 (A) Hardness (B) Toughness
 (C) Ductility (D) Resilience
39. The shear force at the supports of a simply supported beam with a central point load is :
 (A) zero (B) Maximum
 (C) Half the load (D) Equal to the load
40. The SI unit of stress is :
 (A) N (B) N/m
 (C) N/m^2 (D) kg/m^3
41. A ternary kinematic link is defined as:
 (A) A link with three turning pairs
 (B) A link which has three degrees of freedom
 (C) A link that can rotate about three mutually perpendicular axes
 (D) None of the above
42. A higher kinematic pair is formed when :
 (A) The pair has a surface contact between links
 (B) The pair has a point or line contact between links
 (C) The pair has no contact between links
 (D) None of the above

43. Equation of motion for a spring mass system with mass m and spring stiffness k is :
- (A) $m\ddot{x} - kx = 0$ (B) $m\ddot{x} + cx = 0$
 (C) $m\ddot{x} + kx = 0$ (D) $m\ddot{x} - cx = 0$
44. Grashaf's law determines :
- (A) The type of motion in a cam mechanism
 (B) The feasibility of crank rotation in a four-bar chain
 (C) The speed ratio of gears
 (D) The efficiency of a linkage
45. If the line of movement of follower passes through the centre of rotation of cam such follower is known as :
- (A) Conjugate follower (B) Oscillating follower
 (C) Roller follower (D) Radial follower
46. When a series of gears are connected in such a way that two or more gears rotate about an axis with same angular velocity, it is known as :
- (A) Compound gear train (B) Planetary gear train
 (C) Simple gear train (D) Epicyclic gear train
47. Static balancing requires :
- (A) Balancing forces only (B) Balancing couples only
 (C) Balancing forces and couples (D) None of the above
48. The length of stroke in shaper can be adjusted by :
- (A) Pawl and ratchet mechanism (B) Indexing mechanism
 (C) Sliding block in bull gear (D) All of the above
49. Simple indexing is also called :
- (A) Direct Indexing (B) Plain Indexing
 (C) Rapid Indexing (D) None of the above
50. The half-nut mechanism in lathe is essential for :
- (A) Taper turning (B) Facing
 (C) Drilling (D) Thread cutting
51. G/R ratio in material science is related to :
- (A) Morphology of solidifying material
 (B) Plasticity of material in mechanical forming
 (C) Isotropic and anisotropic behaviour of a material
 (D) Degree of cold working done on a material

52. Which one of the following serve as reservoirs of molten metal to supply any molten metal necessary to prevent porosity due to shrinkage during solidification?
- (A) Runner (B) Riser
(C) Sprue (D) Gate
53. Among the following metals, which one shows maximum volumetric solidification contraction?
- (A) Magnesium (B) Copper
(C) Aluminium (D) Zinc
54. Process of removing dissolved gases from molten metal :
- (A) Peeling (B) Purging
(C) Fettling (D) Clogging
55. Draft in a rolling process :
- (A) increases with coefficient of friction between roll and strip, but decreases with roll radius
(B) increases with roll radius, but decreases with coefficient of friction between roll and strip
(C) decreases with both coefficient of friction between roll and strip and roll radius
(D) increases with both coefficient of friction between roll and strip and roll radius
56. Which one among the following is/are true with respect to spreading in rolling process?
- (i) Spreading is seen in rolling plates and sheets with high width-to-thickness ratios.
(ii) Spreading is characterised by width of the strip remaining effectively constant during rolling.
(iii) Spreading increases with increase in friction between roll and strip.
- (A) (i), (ii), (iii) (B) Only (ii)
(C) Only (iii) (D) Only (i) and (iii)
57. Barrelling effect is seen in forging when :
- (A) upsetting hot workpieces between cold dies
(B) resistance to deformation remains same at top, bottom and centre of the material being forged
(C) upsetting is done using proper lubricant
(D) frictional forces that oppose the outward flow of the workpiece at the die interfaces are reduced

- 58.** Process of indenting (but not breaking through) the surface of a workpiece with a punch in order to produce a cavity or an impression is called :
- (A) Hubbing (B) Heading
(C) Piercing (D) Swaging
- 59.** Brittle materials can be successfully extruded by :
- (A) Impact extrusion (B) Cold extrusion
(C) Hydrostatic extrusion (D) Coaxial extrusion
- 60.** Ideally and without friction, the maximum possible reduction in cross-sectional area per pass during a drawing process for a perfectly plastic material is approximately :
- (A) 31% (B) 43%
(C) 56% (D) 63%
- 61.** For straight polarity arc welding, which of the following is/are correct?
- (i) the workpiece is positive and the electrode is negative
(ii) weld penetration is deep
(iii) welds are narrow
- (A) All are correct
(B) Only (i) and (ii) are correct
(C) Only (i) and (iii) are correct
(D) Only (ii) and (iii) are correct
- 62.** Melting away of the base metal and the consequent generation of a groove in the shape of a sharp recess or notch result in :
- (A) Undercutting (B) Underfilling
(C) Lamellar tears (D) Incomplete penetration
- 63.** In order to reduce brittleness and reduce residual stresses, steels hardened by heat treatment are subjected to :
- (A) annealing (B) normalising
(C) tempering (D) quenching
- 64.** Process of making an existing hole dimensionally more accurate that can be achieved by drilling alone and to improve its surface finish :
- (A) Centering (B) Boring
(C) Reaming (D) Countersinking

65. Which component of the lathe is used to move the tool radially in and out and to control its radial position?
- (A) Tool post (B) Apron
(C) Lead screw (D) Cross slide
66. For a single-point cutting tool, which of the following rake is used for cutting tough/brittle materials?
- (A) Negative rake (B) Zero rake
(C) Positive rake (D) Infinite rake
67. Which of the following process is used for achieving the sharpness and trueness of the grinding wheel?
- (A) Balancing (B) Guarding
(C) Dressing (D) Mounting
68. In a grinding wheel marking system, which of the following is the type-c abrasive material?
- (A) Aluminium oxide (B) Silicon carbide
(C) Zirconia alumina (D) None of the above
69. Which of the following milling cutter is NOT an arbor-mount type?
- (A) Cylindrical cutter (B) End-mill cutter
(C) Angle-mill cutter (D) Straddle milling cutter
70. In a milling machine, which of the following device is used for machining holes spaced on a pitch circle diameter?
- (A) Vice (B) Dividing head
(C) Clamp (D) Rotary table
71. In a drilling process, the chips are guided upward through spiral grooves called :
- (A) Web (B) Land
(C) Flute (D) Shank
72. In a pull-type internal broach, the cutting teeth near the shank of the tool is :
- (A) Roughening teeth (B) Semi-finishing teeth
(C) Finishing teeth (D) None of the above
73. The property of tool materials against wear due to intense temperature and pressure is :
- (A) Red Hardness (B) Abrasion Resistance
(C) Toughness (D) Chipping

74. Which of the following factors are to be considered for the selection of sheet metal presses?
- (A) Type of forming operation (B) Size and shape of dies
(C) Tooling (D) All of the above
75. Which of the following formula is used for calculating the cutting force of press tools (S = shear strength, t = thickness, L = length)?
- (A) $F = SL/t$ (B) $F = St/L$
(C) $F = StL$ (D) $F = tL/S$
76. Which type of press working dies are used for performing multiple operations in a single station?
- (A) Simple Die (B) Compound Die
(C) Progressive Die (D) Combination Die
77. The operation performed for punching pattern of holes in a sheet metal is called :
- (A) Perforating (B) Parting
(C) Notching (D) Lancing
78. Which of the following method is used for compensating “springback” in sheet metal operation?
- (A) Flashing (B) Beading
(C) Cupping (D) Bottoming
79. The process of removing extra materials from the sheared edges of the sheet metal is called :
- (A) Nibbling (B) Slitting
(C) Punching (D) Shaving
80. Beveling of the punch and die surfaces in sheet metal operation is to reduce :
- (A) Scrap (B) Stroke length
(C) Cutting force (D) Blank size
81. Which of the following is used to prevent the lifting of sheetmetal along with the punch during the upward stroke?
- (A) Puller (B) Stripper
(C) Pilot (D) Stopper
82. The property of molding sand to allow hot air and gases to pass through the mold wall is called :
- (A) Thermal stability (B) Collapsibility
(C) Permeability (D) Reusability

83. In metal casting, which element in the gating system is used for compensating shrinkage during the solidification process?
- (A) Runner (B) Sprue
(C) Riser (D) Cavity
84. The six-point location principle in the design of locators will reduce the degrees of freedom to :
- (A) Zero (B) One
(C) Two (D) Three
85. In the design of a drill jig, which of the following is used for guiding the tool to the work piece?
- (A) Base plate (B) Drill bush
(C) Body (D) Frame
86. NC contouring is an example of :
- (A) incremental positioning (B) point-to-point positioning
(C) absolute positioning (D) continuous path positioning
87. Which of the following code will give circular interpolation in a clockwise direction?
- (A) G01 (B) G02
(C) G47 (D) G56
88. What type of control system adjusts the output based on the rate of change of the input?
- (A) Derivative control (B) Proportional control
(C) Integral control (D) None of the above
89. Plotter accuracy is measured in terms of :
- (A) Buffer size (B) Vertical dimension
(C) Resolution (D) Intelligence
90. What is the least count of Vernier calipers?
- (A) 0.02 (B) 0.1
(C) 0.2 (D) 0.01
91. What is the use of 'No Go' gauges?
- (A) Check roundness and size at the same time
(B) Check location and size at the same time
(C) Check several dimensions simultaneously
(D) Check a single element of a feature

92. Process of wringing in slip gauge is due to :
(A) Vacuum (B) Air friction
(C) Molecular adhesion (D) Molecular cohesion
93. What is the range of bevel protractor?
(A) 0-360° (B) 0-90°
(C) 90-270° (D) 0-180°
94. Accurate centering of work mounted in an independent chuck can be determined by using :
(A) Surface gauge (B) Dial indicator
(C) Center gauge (D) Height gauge
95. What is the principle of 'Johannson Mikrokator'?
(A) Principle of interference
(B) Principle of transformer
(C) Optical Magnification
(D) Button spinning on a loop of string
96. Which of the following is the direct measure of surface finish in Wallace Surface dynamometer?
(A) Length of swing (B) Angle of swing
(C) Time of swing (D) Height of swing
97. A tolerance diagram is also called :
(A) Tier chart (B) Defect concentration diagram
(C) Scatter diagram (D) Histogram
98. Which of the following is not the type of FMS?
(A) Flexible transfer lines (B) Flexible machining systems
(C) Flexible tool handling systems (D) Flexible manufacturing cells
99. Cooperative supply chain relationships developed to enhance the overall business performance of both parties is a definition of :
(A) third-party logistics (B) relationship marketing
(C) supply chain collaboration (D) dovetailing
100. Which of the following is mandatory in TQM to attain customer satisfaction?
(A) Manager involvement (B) Total employee involvement
(C) Founder involvement (D) Relationship marketing
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SPACE FOR ROUGH WORK

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