

This Question Booklet contains
12 printed pages

PGMT

A
Seal Sticker

Total Marks : 100
Time : 100 Minutes

Question
Booklet
Code :

A

Candidate's
Seat No. :

Candidate's Signature _____ Block Supervisor's Signature _____

DO NOT OPEN QUESTION BOOKLET UNTIL INSTRUCTED.

INSTRUCTIONS FOR CANDIDATE:

1. Check Number printed on your OMR SHEET and Question Paper with your SEAT No. before answering the questions. Consult block supervisors in case the above mentioned numbers do not match with your seat number.
2. There are total 100 questions. For answer of each question A, B, C, D, E options are given in OMR SHEET. In OMR SHEET, there is "E" option. "E" option is for "Not Attempted". If candidate do not wish to answer the question he/she should select "E" option (Not Attempted). All questions are compulsory.

For Example:

Which state of India has the longest sea shore ?

A ☐ B ☐ C ☒ D ☐ E ☐

(A) Maharashtra (B) Tamilnadu
(C) Gujarat (D) Andhra Pradesh

In this example, the right answer is (C). Therefore, the Circle of (C) has been darkened (encoded). Candidate should not give the answer "Gujarat" in writing.

The options once darkened/answered by candidate cannot be changed.

3. Candidates are not permitted to leave examination hall during examination.
4. Candidates must strictly enter SEAT NO. in the designated space provided in OMR SHEET as well as Question Paper neatly as soon as they receive the OMR SHEET & Question Paper.
5. Candidates must not write name or put any identification sign/symbol on OMR SHEET. In such case strict disciplinary action will be taken against candidate & will be considered disqualified/ineligible. Only Seat No. must be

entered at designated space provided in OMR SHEET.

6. Both, Candidate's & Supervisor's signature must be done on Certificate of OMR SHEET. Unsigned OMR SHEET would not be considered for evaluation.
7. Candidates are not permitted to use or carry with them any kind of literature, guide, hand written notes, or printed books, mobile phone, pagers, smart watches, camera or any electronic gadgets to examination hall.
8. Use of only Non-scientific / Non-programmable calculator shall allow during examination.
9. Candidates are not permitted to talk/discuss in the Examination Hall. Any candidate found violating supervisor's instructions will be disqualified.
10. Candidates must fully darken circle A, B, C, D and E accordingly with Blue / Black ball pen. If answers are marked with any other coloured ball pen, pencil, white ink (whitner), any corrections are done by candidate by means of blade or rubber or whitner will not be considered for evaluation.
11. Candidates may carry QP with them after Examination.
12. **For correct answer 1 (One) marks will be given.**

If candidate gives more than one option as answer for one question in answer sheet (OMR SHEET), or gives wrong answer then the candidate will be allotted Zero (0) marks.

If candidate does not want to answer a particular question and marks (E) or leave the option without encoding on OMR sheet, then no minus marks will be given.

Submit the OMR SHEET to the block supervisor after completion of examination without fail before leaving examination hall, failure to do so will result in disqualification of the candidature for the examination and disciplinary action will be taken against such candidate.

1. What is atomic packing factor of BCC
 (A) 0.60 (B) 0.66
 (C) 0.68 (D) 0.74
2. Diffusion Co-efficient increases with
 (A) Increasing temperature (B) Decreasing temperature
 (C) No effect of temperature (D) All of the above
3. The range of dislocation density of heat treated deformed metal is
 (A) $10^4 - 10^6$ (B) $10^5 - 10^6$
 (C) $10^6 - 10^7$ (D) $10^{11} - 10^{13}$
4. The Preferred slip direction for tungsten is
 (A) $\langle \bar{1}11 \rangle$ (B) $\langle \bar{1}\bar{1}1 \rangle$
 (C) $\langle 1\bar{1}\bar{1} \rangle$ (D) $\langle 110 \rangle$
5. Number of slip system of Bcc in slip Plane $\{321\}$ is
 (A) 6 (B) 8
 (C) 12 (D) 24
6. Stretcher strain found in low carbon steel associated with
 (A) Dislocation density (B) Yield point phenomena
 (C) Thickness of sheet (D) Texture
7. With increase in annealing temperature, the defect density decreases
 (A) Grain boundary (B) Dislocation
 (C) Vacancy (D) All of the above
8. The low angle grain boundary occurs when the orientation difference between the adjacent grains is of the order of
 (A) 1 (B) 10
 (C) 100 (D) 1000
9. Coring is often being removed by Sub segment
 (A) Homogenization process (B) Hot working process
 (C) Annealing process (D) All of the above
10. Creep resistance decreases due to
 (A) Large grain size (B) Small grain size
 (C) Fine dispersoid size (D) High melting point
11. What is the eutectic composition in the Pb-Sn diagram?
 (A) 39.1% Pb and 60.9% Sn (B) 33.1% Pb and 66.9% Sn
 (C) 38.1% Pb and 61.9% Sn (D) 39.1% Pb and 64.9% Sn
12. At 910°C $\gamma\text{-Fe}$ transform to $\alpha\text{-Fe}$ resulting in a percentage volume expansion of
 (A) 7.1 (B) 8.1
 (C) 8.8 (D) 9.8
13. Which Brass is suitable for high speed machining?
 (A) Red Brass (B) Leaded Brass
 (C) Yellow Brass (D) Muntz metal

14. Crystal structure of Tungsten is
 (A) DC (B) SC
 (C) FCC (D) BCC
15. Thoria is a
 (A) Dispersion strengthened composite (B) Particle Reinforced composite
 (C) Fiber reinforced composite (D) Polymer
16. Consider an ideal solution of component A & B. The entropy of mixing per mole of an alloy containing 50% atoms B is
 (A) $R \ln 2$ (B) $3R \ln 2$
 (C) $-R \ln 2$ (D) $-3R \ln 2$
17. The unit of the rate constant for 9 second order reaction
 (A) $\text{moles}^1 \text{sec}^{-1}$ (B) $\text{moles}^{-1} \text{sec}^{-1}$
 (C) $\text{moles}^1 \text{sec}^1$ (D) $\text{moles}^0 \text{sec}^{-1}$
18. The bulk modulus of a material with Poisson's ratio of 0.5 is equal to
 (A) $3 \times \text{Young's modulus}$ (B) $2 \times \text{Young's modulus}$
 (C) Young's modulus (D) Infinity
19. The single most important requirement for a turbine blade material is
 (A) resilience (B) creep resistance
 (C) hardness (D) DBTT
20. The entropy change for a spontaneous process is
 (A) > 0 for system and surrounding (B) < 0 for system and surrounding
 (C) < 0 for system (D) > 0 for system
21. Spring back in sheet metal bending depends on
 (A) thickness of sheet (B) elastic limit
 (C) degree of bend (D) All of above
22. In the commercial production of which of the following metal, metallothermic reaction is used?
 (A) Nickel (B) Copper
 (C) Aluminum (D) Zinc
23. Eutectic Al-Si alloy castings are modified by
 (A) P (B) Na
 (C) S (D) N
24. The Pig Iron contains approximately
 (A) 91% Iron, 8% Carbon (B) 93% Iron, 6% Carbon
 (C) 95% Iron, 4% Carbon (D) 97% Iron, 2% Carbon
25. Cold ducts are
 (A) casting defect (B) forging defect
 (C) welding defect (D) machining defect
26. Flange wrinkling is the defect found in
 (A) Spinning (B) Deep drawing
 (C) blanking (D) bending

27. Which of the following type of bearing bronze is the weakest?
(A) Sintered bronze (B) Phosphorus bronze
(C) Leaded bronze (D) Plain tin bronze
28. Which among the following is an example of a non heat treatable alloy?
(A) Al-Cu (B) Al-Li
(C) Al-Si (D) Al-Mn
29. Artificial aging process in aluminum alloy takes place at a temperature range of
(A) 150-190°C (B) 190-260°C
(C) 260-300°C (D) 300-350°C
30. Sprue in casting refers to
(A) Riser (B) Runner
(C) Vertical passage (D) Horizontal passage
31. Loam sand comprises of
(A) 50% clay & 18% moisture (B) 50% clay & 50% moisture
(C) 50% sand & 50% moisture (D) 50% sand & 10% moisture
32. Which of the following is a casting defect
(A) Shift (B) Blow hole
(C) Scab (D) All of above
33. Spelter is commercial form of
(A) Copper (B) Lead
(C) Zinc (D) Aluminum
34. Least shrinkage allowances is provided in the case of
(A) Steel (B) Brass
(C) Gray cast iron (D) Aluminum
35. One carat diamond is equal to
(A) 100 mg (B) 200 mg
(C) 400 mg (D) 500 mg
36. Carburizing flame has
(A) 1 zone (B) 2 zone
(C) 3 zone (D) 4 tone
37. Ornaments are cast by
(A) die casting (B) slush casting
(C) centrifugal casting (D) gravity casting
38. Magnet steel contains high percentage of
(A) Aluminum (B) Nickel
(C) Cobalt (D) Tungsten
39. High alloy steel have to be heated slowly and uniformly for hardening to avoid
(A) Warpage (B) Scaling
(C) Segregation (D) Over heating

40. The alloying element silicon added to copper
(A) to improve hardness and strength (B) to improve machining properties
(C) to improve weldability (D) to improve conductivity
41. Austenite grain growth during heat treatment of steel can be inhibited by addition of
(A) Magnesium (B) Manganese
(C) Aluminum (D) Copper
42. What is the order of vacuum maintained during electron beam welding?
(A) 10^{-1} to 10^{-3} torr (B) 10^{-2} to 10^{-4} torr
(C) 10^{-3} to 10^{-5} torr (D) 10^{-4} to 10^{-6} torr
43. Which is the strongest brazing joint?
(A) scarf (B) lap
(C) butt (D) all of above
44. Weld spatter is
(A) welding test (B) welding defect
(C) welding flex (D) electrode coating
45. Which welding process would be best suited to weld two 20 mm thick MS plate?
(A) TIG welding (B) Submerge Arc welding
(C) Electroslag welding (D) Resistance welding
46. What is temperature of plasma torch?
(A) 3000°C (B) 1000°C
(C) 23000°C (D) 33000°C
47. The purpose of inoculation is
(A) to modify properties of cast metal
(B) to change chemical composition of cast metal
(C) to get clean casting
(D) to increase meeting temperature gear metal
48. Drossing in foundry practice refers to
(A) Formation of oxide on molten metal surface
(B) Method of cleaning casting
(C) Inspection method of casting
(D) Method of deoxidation of molten metal
49. Forging of plain carbon steel is carried out at
(A) 1100°C (B) 1200°C
(C) 1300°C (D) 1400°C
50. Large size bolt heads are made by
(A) Roll forging (B) Upset forging
(C) Swaging (D) Tumbling
51. HSS retain their hardness up to a temperature of
(A) 500°C (B) 700°C
(C) 900°C (D) 1000°C

52. As the impurities are oxidized, the melting point of pure iron
 (A) decreases (B) increases
 (C) unchange (D) none of above
53. Which of the following steel has almost zero temperature co-efficient?
 (A) Invar steel (B) Stainless steel
 (C) Cobalt steel (D) Silicon steel
54. Coal used in cupola is
 (A) Bituminous coal (B) Coke
 (C) Charcoal (D) Pulverised coal
55. Tap to Tap time in LD process is
 (A) 20-40 min (B) 30-50 Min
 (C) 50-80 min (D) 50-60 Min
56. Induction furnace uses
 (A) Low frequency DC source (B) High frequency DC source
 (C) High frequency AC source (D) Low frequency AC source
57. The height of LD vessel is
 (A) 5-7 m (B) 7-10 m
 (C) 8-12 m (D) 9-12 m
58. Chilled cast iron has
 (A) 0% graphite (B) 5% graphite
 (C) 10% graphite (D) 15% graphite
59. German silver is an alloy of
 (A) Copper, Nickel, Zinc (B) Nickel Copper, Tin
 (C) Silver, Gold, Tin (D) Silver, Nickel, Copper
60. Hastelloy contains
 (A) Nickel, Copper (B) Nickel, Carbon
 (C) Nickel, Molybdenum (D) Nickel, Silver, Aluminum
61. In resistance welding, voltage used for heating is
 (A) 10 V (B) 50 V
 (C) 100 V (D) None of these
62. In acid Bessemer process
 (A) oxygen is blown (B) hot air blown
 (C) cold air blown (D) all of above
63. % CaO contain in limestone is
 (A) 45-50 (B) 50-55
 (C) 55-60 (D) 60-65
64. Argentite is the principal ore of
 (A) silver (B) copper
 (C) lead (D) tin

65. In ganister, % of which component is highest?
 (A) CaO (B) SiO₂
 (C) P₂O₅ (D) MgO
66. The material used for coating, welding electrode is called
 (A) Binder (B) Flux
 (C) Protective layer (D) Slag
67. Connecting rod is usually made of
 (A) Low carbon steel (B) Medium carbon steel
 (C) High carbon steel (D) Aluminum
68. Which of the following material pipe is least corrosion resistance?
 (A) mild steel (B) copper
 (C) wrought iron (D) stainless steel
69. In the Midrex process, ore is used in the form of
 (A) Lumpy ore (B) Briquette
 (C) Sintre (D) Pellets
70. What is carbon % in cold rolled sheet?
 (A) 0.1 (B) 0.2
 (C) 0.3 (D) 0.4
71. In low shaft furnace CO/CO₂ ratio is
 (A) 2 (B) 4
 (C) 6 (D) 8
72. The composition of silver solder is
 (A) Silver, Lead, Zinc (B) Silver, Copper, Zinc
 (C) Silver, Lead, Tin (D) Sliver, Copper, Tin
73. The temporary shutdown of blast furnace is known as
 (A) Blowing out (B) Drying
 (C) Banking (D) None of above
74. Boudouard equilibrium reaction is
 (A) $\{CO_2\} + <C>_g = 2\{CO\}$ (B) $\{CO_2\}_{(g)} + <C>_s = 2\{CO\}$
 (C) $<C> + \{CO\} = 2\{CO_2\}$ (D) None of above
75. Swaging is an operation of
 (A) Forging (B) Extrusion
 (C) Drawing (D) Piercing
76. Which of the following alloys have copper as one of the constituents?
 (A) Monel Metal (B) Delta Metal
 (C) Constantan (D) All of above
77. Permalloy is a:
 (A) Iron, chromium, and nickel alloy (B) Nickel and cobalt alloy
 (C) Nickel and iron alloy (D) Cutting tool material

78. Deformation band is not observed in
 (A) DC (B) BCC
 (C) FCC (D) HCP
79. Degradation of polymer is
 (A) Physical (B) Chemical
 (C) Physiochemical (D) None of above
80. The direction of crack propagation in stress corrosion is
 (A) 30° to the applied stress (B) 45° to the applied Stress
 (C) Perpendicular to me applied stress (D) Parallel to the applied stress
81. If $u = e^x + y$ and $v = e^x + 7y$, then the Jacobian $\frac{\partial(x,y)}{\partial(u,v)}$ equals _____.
 (A) $7e^x$ (B) $6e^x$
 (C) $7e^{-x}$ (D) $\frac{e^{-x}}{6}$
82. Let $f : [0,1] \rightarrow \mathbb{R}$ be continuous function which is differentiable on $(0, 1)$ and such that $f(0) = 1$ and $f(1) = 0$. Then which of the following statements is true in general ?
 (A) There exists $c \in (0, 1)$ such that $f(c) = cf'(c)$
 (B) There exists $c \in (0, 1)$ such that $f(c) = -cf'(c)$
 (C) There exists $c \in (0, 1)$ such that $f'(c) = cf(c)$
 (D) There exists $c \in (0, 1)$ such that $f'(c) = -cf(c)$
83. If $f(x, y) = x^2y - xy^2 + 4xy - 4x^2 - 4y^2$ then $(0, 0)$ is
 (A) A point of minima (B) A point of maxima
 (C) A saddle point (D) None of these
84. The improper integral $\int_0^{\pi/2} \frac{\sin x}{\sqrt{1-\cos x}} dx$ is
 (A) divergent (B) convergent and its value is 0
 (C) convergent and its value is 1 (D) convergent and its value is 2
85. Let C denote the closed curve in the first quadrant formed by the parabolas $y^2 = 4x$ and $x^2 = 4y$.
 If the area bounded by C is $\frac{16}{3}$, then the value of the line integral $\oint_C (x dy - y dx)$ is
 (A) $\frac{8}{3}$ (B) $\frac{16}{3}$
 (C) $\frac{32}{3}$ (D) $\frac{4}{3}$
86. The general solution of the equation $y'' + 2y' - y = 0$ is
 (A) $y = e^{-x} (c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{2}x})$ (B) $y = e^{\sqrt{2}x} (c_1 e^x + c_2 e^{-x})$
 (C) $y = e^x (c_1 e^{\sqrt{2}x} + c_2 e^{-\sqrt{2}x})$ (D) $y = e^{-\sqrt{2}x} (c_1 e^x + c_2 e^{-x})$

87. If the general solution of the equation $\frac{dy}{dx} + y \sin x = e^{\cos x}$ is $(f(x) + c)e^{\cos x}$, then $f(x)$ equals _____
 (A) $\sin x$ (B) $\cos x$
 (C) x (D) 0
88. The inverse Laplace transform of the function $F(s) = \frac{1}{S^2(S^2+1)}$ is
 (A) $t \cos t$ (B) $t \sin t$
 (C) $t - \cos t$ (D) $t - \sin t$
89. If the Laplace transform of the function $f(t) = \frac{\cos 2t \sin t}{e^t}$ is denoted by $F(s)$, then the value of $F(0)$ is
 (A) $\frac{-1}{5}$ (B) $\frac{1}{5}$
 (C) $\frac{-1}{10}$ (D) $\frac{1}{10}$
90. Which of the following is a solution of Laplace equation in two dimensions ?
 (A) $e^{-y} \cos x$ (B) $x^2 + y^2$
 (C) $e^{-y} + \cos x$ (D) $x^3 + 3x^2 - 3y^2 + 1$
91. If the eigen values of the matrix $\begin{bmatrix} a & 1 \\ 1 & 2b \end{bmatrix}$, (where $a, b > 0$), are 2 and 3 then the point (a, b) lies on which of the following straight lines ?
 (A) $x + y = 5$ (B) $x + 2y = 6$
 (C) $x + y = 1$ (D) $x + 2y = 5$
92. Let A be a square matrix of order 3 and suppose $\det A \neq 0$. Then the non-homogeneous system of linear equations $Ax = b$ has
 (A) no solution (B) unique solution
 (C) three solutions (D) infinite solutions
93. Let $C = \{Z : |z| = \frac{3}{2}\}$. Then the value of the contour integral $\int_C \frac{\cos(2\pi z)}{z^2 - 3z + 2} dz$ is
 (A) $-2\pi i$ (B) $2\pi i$
 (C) 1 (D) -1
94. The coefficient of Z^2 in the Taylor series expansion of $f(z) = \sin^2 z$ about $z = 0$ is
 (A) 0 (B) 1
 (C) 2 (D) $\frac{1}{2}$
95. Consider functions $f(z) = \bar{z}$ and $g(z) = e^{\bar{z}}$ defined over complex numbers, Then
 (A) f and g both are analytic in C (B) f is analytic but g is not analytic in C
 (C) g is analytic but f is not analytic in C (D) Neither f nor g is analytic in C

96. Bag A contains 2 white and 3 red balls and Bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and it is found to be white. What is the probability that the white ball is drawn from Bag B ?
- (A) $\frac{9}{19}$ (B) $\frac{18}{19}$
 (C) $\frac{5}{19}$ (D) $\frac{10}{19}$
97. The probability of obtaining at least two 'Five' in rolling a fair die 3 times is
- (A) $\frac{2}{9}$ (B) $\frac{1}{9}$
 (C) $\frac{2}{27}$ (D) $\frac{1}{27}$
98. If the mean of the 15 observations is $x_1, x_2, \dots, x_{14}, x_{15}$ is 15 then the mean of the 15 observations $y_1, y_2, \dots, y_{14}, y_{15}$ (where $y_i = x_i + i$ for $i = 1, 2, \dots, 15$) is
- (A) 23 (B) 22
 (C) 11 (D) 9
99. Which of the following iteration formula is suitable for computing the cube-root of the number 11?
- (A) $x_{n+1} = \frac{x_n^3 + 11}{2x_n^2}$ (B) $x_{n+1} = \frac{3x_n^3 + 11}{2x_n^2}$
 (C) $x_{n+1} = \frac{2x_n^3 + 11}{3x_n^2}$ (D) $x_{n+1} = \frac{x_n^3 + 11}{3x_n^2}$
100. Which of the following is a single step method for numeric solution of ordinary differential equations?
- (A) Gauss - Jordan method (B) Secant method
 (C) Runge - Kutta method (D) Bisection method

