

Seat No. _____

SUB: METALLURGY ENGINEERING (MT)

Time: 1 Hour 30 minutes

Instructions:

- 1. Ensure that all pages are printed.**
- 2. Use Black ball pen only**
- 3. Change in option is not allowed**
- 4. There is no negative marking**
- 5. Use of non-programmable scientific calculator is allowed**

1. Equation which relates pressure, volume and temperature of a gas is called the
 - A Equation of state
 - B Gibb's-Duhem equation
 - C Ideal gas equation
 - D Maxwell's equation
2. Eutectoid product in Fe-C system is called
 - A Pearlite
 - B Bainite
 - C Ledeburite
 - D Spheroidite
3. Which one of the following is not a strong bond?
 - A Van der Waals bond
 - B Covalent bond
 - C Metallic bond
 - D Ionic bond
4. Fatigue is phenomena caused by
 - A stress above ultimate tensile stress
 - B Cyclic stress
 - C Both a and b
 - D None of these
5. In fcc lattice, the packing sequence of atoms is
 - A AB AB AB.....
 - B BC BC BC.....
 - C AC AC AC.....
 - D ABC ABC.....
6. Diffusion can occur in _____ materials.
 - A Solid
 - B Liquid
 - C Gaseous
 - D All
7. The line/surface in an equilibrium diagram which indicates the temperature of the beginning of solidification or completion of melting is called
 - A Solidus
 - B Liquidus
 - C Solidification
 - D Melting
8. Plastic deformation results from the following
 - A Slip
 - B Twinning
 - C Both
 - D None

9. What is the emissivity of a black body?
 A 1 B 0
 C 0.9 D 0.5
10. To predict out of any two metal which should corrode on coupling _____ can be used.
 A EMF Series B Periodic Table
 C Weight of Metal D Area of Metal
11. Failure due to excessive deformation is controlled by _____.
 A Material properties B Design & Dimensions
 C Both (a) and (b) D None
12. Extractive metallurgy is the combination of
 A Process metallurgy and physical metallurgy Chemical metallurgy and physical metallurgy
 C Process metallurgy and chemical metallurgy Process metallurgy and material science
13. Usual casting method for making dental crowns
 A Sand casting B Die casting
 C Continuous casting D Investment casting
14. Suitable case hardening process for plain carbon steel, containing 0.2 per cent carbon is
 A Carburizing B Nitriding
 C Cyaniding D Carbo-nitriding
15. In bcc crystals the direction of close packed plane is
 A $\langle 100 \rangle$ B $\langle 010 \rangle$
 C $\langle 111 \rangle$ D $\langle 001 \rangle$
16. In Ellingham diagram, lower position oxide is more ----- oxide than upper position oxide
 A Unstable B Strong
 C Stable D Weak
17. T T T diagram is also known as
 A S-curve or C-curve B Bain's curve
 C Isothermal transformation diagram D All A, B and C
18. Frank-Read source is concerned with
 A Dislocation B Diffusion
 C Age hardening D None of these
19. Corrosion of metals involves
 A Physical reactions B Chemical reactions
 C Both D None
20. Duralumin is an alloy of aluminium,
 A Copper and manganese B Nickel and silicon
 C and nickel D None of these
21. Free carbon distributed throughout the mass in ductile cast iron is in the form of
 A Nodules B Flakes
 C Needles D Crystals
22. In connection with the corrosion of metals, passivation is the process that
 A Intensifies deterioration B Changes the composition of the metal
 C Inhibits further deterioration D None of these
23. Recrystallization temperature depends on
 A Amount of prior cold work B Carbon content
 C Purity of alloy D Both (A) and (B)
24. Strain-time curve is plotted of

- Page 4 of 10

- | | | | |
|---|---|---|---|
| A | 0 | B | 1 |
| C | 2 | D | 3 |
46. Aluminium alloys find use in aircraft industry because of
- | | | | |
|---|---------------------------|---|------------------|
| A | High strength | B | Low sp. Gravity |
| C | Good corrosion resistance | D | Good weldability |
47. Sulphide ore is generally concentrated by
- | | | | |
|---|---------------------|---|--------------------------|
| A | Roasting | B | Froth floatation process |
| C | Reduction by carbon | D | Tempering |
48. In salt bath furnaces, heat is transferred to the charge mainly by
- | | | | |
|---|------------|---|---------------|
| A | Conduction | B | Convection |
| C | Radiation | D | None of these |
49. The following phenomena are useful in zone-refining process
- | | | | |
|---|--------|---|-------------|
| A | Coring | B | Segregation |
| C | Both | D | None |
50. In secondary stage of Creep, creep rate is
- | | | | |
|---|----------|---|---------------|
| A | Minimum | B | Maximum |
| C | Constant | D | Unpredictable |
51. Alpha brasses have composition
- | | | | |
|---|-----------------|---|-----------------|
| A | 60 % Cu-40 % Zn | B | 70 % Cu-30 % Zn |
| C | 80 % Cu-20 % Zn | D | 75 % Cu-25 % Zn |
52. The entropy -----, when a spontaneous change occurs in an isolated system.
- | | | | |
|---|--------------|---|------------------|
| A | Decreases | B | Increases |
| C | Is unchanged | D | Is equal to zero |
53. The teeth of spur gear are hardened by
- | | | | |
|---|----------------------|---|---------------------|
| A | Cold working | B | Quenching |
| C | Dispersion hardening | D | Induction hardening |
54. Which is the ore of lead?
- | | | | |
|---|--------|---|-----------|
| A | Galena | B | Anglesite |
|---|--------|---|-----------|

67. A tooth paste tube can be produced by
 A Solid forward extrusion B Solid backward extrusion
 C Hollow backward extrusion D Hollow forward extrusion
68. Number of component (C), phase (P) and degrees of freedom (F) are related by Gibb's phase rule as
 A $P+F-C=2$ B $C=P-F+2$
 C $F=C-P-2$ D $P=F-C-2$
69. Sweep pattern is used for moulding parts having
 A Rectangular shape B Elliptical shape
 C Circular shape D Complicated shape having intricate details'
70. Which substance is used to decrease the melting point of alumina in Hall - Haroult process?
 A CuSO_4 B Cryolite
 C Gypsum D Limonite
71. In four stand high mills the backup rolls are_____ work rolls.
 A Smaller than B Bigger than
 C Equal to D None of these
72. Which of the following is a line defect found in metal crystals?
 A Grain boundaries B Cracks
 C Edge dislocations D None of these
73. Iron is non-magnetic
 A Above Curie point B When its lattice structure is fcc
 C When it is in γ -iron form D All A, B and C
74. Which of the following alloying elements, when added to plain C steel, increase its corrosion / oxidation resistance?
 A Chromium B Cobalt
 C Molybdenum D Tungsten
75. For high temperature creep application, the desirable grain size is
 A Fine B Coarse
 C Ultra-fine D None of these
76. For selecting material for spring which of following properties are considered.
 A Stiffness B Fatigue

- C A and B both D Creep

77. The property which enables metals to be drawn into wire is known as
 A Malleability B Ductility
 C Straining D Elastic deformation

78. Damage to metal surface caused by mechanical action is called
 A Pitting B Corrosion
 C Erosion D None of these

79. Metal matrix composite is made of
 A Metal matrix with metal reinforcement B Metal matrix with ceramic reinforcement
 C Metal matrix with polymer reinforcement D None of above

80. In L-D steelmaking, the final slag can be best described as
 A Oxidizing B Basic
 C Oxidizing and basic D Reducing and basic

81. The lowest eigen value of the matrix $\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$ is
 A 1 B 2
 C -1 D 5

82. The system of linear equations $x + 2y = 5$; $4x + 8y = 12$; $3x + 6y + 3z = 15$ has
 A No solution B Unique solution
 C Infinitely many solutions D None

83. If $z = \sin\left(\frac{x-y}{x+y}\right)$ then the value of $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y}$ is
 A $2 \sin\left(\frac{x-y}{x+y}\right)$ B 1
 C 0 D $\sin\left(\frac{x-y}{x+y}\right)$

84. The function $f(x, y) = 2x^2 + 2xy - y^3$ has
 A Only one stationary point at (0,0) B stationary points : (0,0) $\left(-\frac{1}{6}, \frac{1}{3}\right)$
 C stationary points at: (0,0)(-1,1) D stationary points : (0,0) $\left(\frac{1}{6}, -\frac{1}{3}\right)$

85. $\lim_{a \rightarrow b} \frac{a^b - b^a}{a^a - b^b} =$
 A $\frac{1 + \log b}{1 - \log b}$ B 0
 C $\frac{1 - \log b}{1 + \log b}$ D e

86. The area bounded by the parabola $y = x^2$ and the lines $x = 4$ and $y = 0$ is equal to

- A 64
C 128/3

B 64/3
D none

87. Changing the order of integration of $I = \int_0^2 \int_{x^2}^{2x} f(x, y) dy dx$ leads to the integral $I = \int_r^s \int_p^q f(x, y) dy dx$ the value of q is
A 0
C \sqrt{y}
B $y/2$
D 4

88. If $y(x) = x + \sqrt{x + \sqrt{x + \sqrt{x + \dots \infty}}}$ then $y(4) =$
A $\frac{9+\sqrt{17}}{2}$ or $\frac{9-\sqrt{17}}{2}$
C $\frac{9+\sqrt{17}}{2}$ only
B $\frac{9-\sqrt{17}}{2}$ only
D ∞

89. The directional derivative of $u(x, y, z) = x^2 + 2y^2 + z$ at a point $(1, 1, 2)$ in the direction of $3i - 4j$ is
A -4
C -1
B -2
D 1

90. The curl of the gradient of the scalar field $v(x, y, z) = 2xyx^2 + 3xy^2z + 4xyz^2$ is
A 0
C $4xyi + 6yzj + 8xzk$
B 1
D $4xy + 6yz + 8xz$

91. Consider a company that assembles computers. The probability of a faulty assembly of any computer is p . The company subjects each computer to a testing process. This testing process gives the correct result for any computer with a probability q . What is the probability of a computer being declared faulty?
A $pq + (1-p)(1-q)$
C $(1-p)q$
B $(1-q)p$
D pq

92. The solution of $\frac{d^2y}{dx^2} - 25y = e^{3x}$ is
A $y = C_1 \cos 5x + C_2 \sin 5x + e^{3x}/16$
C $y = C_1 e^{5x} + C_2 e^{-5x} + e^{3x}/16$
B $y = C_1 e^{5x} + C_2 e^{-5x} - e^{3x}/16$
D $y = C_1 \cos 5x + C_2 \sin 5x - e^{3x}/16$

93. If $f(z) = u(x, y) + iv(x, y)$ is an analytics function of complex variable z then
A $u_x = v_y, u_y = v_x$
C $u_x = -v_y, u_y = v_x$
B $u_x = -v_y, u_y = -v_x$
D $u_x = v_y, u_y = -v_x$

94. The solution of $yy' + 25x = 0$ represents
A Family of circles
C Family of parabolas
B Family of ellipses
D Family of hyperbolas

95. The number of boundary condition required to solve the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$
A 1
C 4
B 2
D none

96. The inverse Laplace transforms of $\frac{1}{s(s+1)}$ is
- A $\sin t$ B $e^{-t} \sin t$
 C e^{-t} D $1 - e^{-t}$
97. If $f(z) = x^3 - 3xy^2 + iv(x, y)$ is an analytic function then $v(x, y)$
- A $y^3 - 3x^2y + \text{constant}$ B $3x^2y - y^3 + \text{constant}$
 C $x^4 - 4x^3y + \text{constant}$ D $xy - y^2 + \text{constant}$
98. If C is the simple closed curve around the origin then the value of $\oint_C \frac{\sin z}{z} dz$
- A 0 B $2\pi i$
 C ∞ D $1/2\pi i$
99. The iteration formula to find the n^{th} root of a positive real number b by using the Newton-Raphson method is
- A $x_{k+1} = \frac{(n-1)x_k^n + \sqrt[n]{b}}{nx_k^{n-1}}$ B $x_{k+1} = \frac{(n-1)x_k^n - \sqrt[n]{b}}{nx_k^{n-1}}$
 C $x_{k+1} = \frac{(n-1)x_k^n + b}{nx_k^{n-1}}$ D $x_{k+1} = \frac{(n-1)x_k^n - b}{nx_k^{n-1}}$
100. Trapezoidal's rule for integration gives exact result when $f(x)$ is a polynomial function of degree less or equal to
- A 1 B 2
 C 3 D 4