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 B Chemical metallurgy and physical metallurgy
   C Process metallurgy and chemical metallurgy D 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 Carbo-nitriding
15. In bcc crystals the direction of close packed plane is
   A <100> B <010>
   C <111> D <001>
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

A Tensile Test B Fatigue test

C Creep test D Hardness test

25. Which of the following steel making processes does not employ oxygen blowing in the converter?
A Acid Bessemer converter B Kaldo rotary converter

C L.D. converter D Basic open-hearth furnace

26. With respect to the matrix of Al-Cu alloys, G-P zones are
A Coherent B Incoherent

C Semi-coherent D Chemically indistinguishable

27. The stress below which failure never occurs in fatigue even for an indefinitely large number of loading cycles is known as
A Yielding limit B Endurance limit

C Stress corner D Proof stress

28. The equilibrium constant for any reaction is explained by
A Sievert's law B Hess's law
C Law of mass action D Henry's law

29. The word 'ceramic' meant for

A Soft material B Hard material
C Burnt material D Dry material

30. In normalizing, one of the following is not correct
A It relieves internal stresses B It produces a uniform structure
C The rate of cooling is rapid D The rate of cooling is slow

31. The metal is subjected to mechanical working for

A Refining grain size B Reducing original block into desired shape

C Controlling the direction of flow lines D All of these

32. Oxygen to acetylene ratio in case of oxidizing flame is
A 1:1 B 1.5:1
C 2:1 D 2.5:1

33. Excess of lime addition in basic steel making processes makes
A The slag viscous B The slag fluid
C No change in slag viscosity D Hot heat

34. Martensite is formed by _____ transformation.
A Diffusion B Isothermal

C Athermal D None of these

35. Prandtl number is the ratio of
A Mass diffusivity to thermal diffusivity B Momentum diffusivity to thermal diffusivity
C Thermal diffusivity to mass diffusivity D Thermal diffusivity to momentum diffusivity

36. The technology called metal injection molding (MIM) involves the use of

A Standard metal powders
B Sub-sieve metal powders
C Oxidized metal powders
D Heavily lubricated metal powders

37. The adhesiveness is the property of sand due to which

A It evolves a great amount of steam and other gases
B The sand grains stick together
C It clings to the sides of a moulding box
D None of these

38. The hardness of quenched Martensite

A increases with increasing carbon percentage
B decreases as carbon percentage increases
C first increases and then remains almost constant as the carbon percentage increases
D first increases and then decreases as carbon percentage increases

39. Cup-shaped articles like bath tubs are generally made from flat sheets by ---------- operation.

A Rolling
B Forging
C Extrusion
D Deep-drawing

40. During LD blow in steelmaking the impurity that gets removed first is

A Carbon
B Phosphorous
C Manganese
D Silicon

41. Steel is

A An alloy of iron and carbon
B Pure iron
C Oxidized iron
D A mixture of iron and silver

42. Miller indices of the diagonal plane of a cube are

A (200)
B (111)
C (010)
D (110)

43. Super saturated solid solution of carbon in alpha iron is known as

A Austenite
B Cementite
C Ferrite
D Martensite

44. Cold worked components are generally subjected to

A Normalizing
B Tempering
C Annealing
D Shot peening

45. In a single-component condensed system, if degree of freedom is zero, maximum number of phases that can co-exist

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

C Cerussite D Cassiterite

55. What is the most common carbon steel found in boilers, pressure vessels, tanks, and piping?
A Low carbon steel B Medium carbon steel
C High carbon steel D None of these

56. Turbine blade failure occurs due to
A Creep B Fatigue
C A and B both D None of these

57. The coke bed height in cupola is height of the coke from
A Slag tapping spout B Metal tapping spout
C Tuyeres level D Charging platform

58. Shatter index of B.F. coke is a measure of its
A Strength B Hardness
C both A & B D neither A not B

59. The purpose of a riser is to
A Deliver molten metal into the mould cavity B Act as a reservoir for the molten metal
C Feed the molten metal to the casting in order to compensate for the shrinkage D Deliver the molten metal from pouring basin to gate

60. Rolling machine is amenable to NC CNC is
A Pyriamid machine B Three roll single pinch machine
C Four roll double pinch machine D Three roll double pinch machine

61. The material in which there is conduction primarily by holes is
A Conductor B Insulator
C p-type semiconductor D n-type semiconductor

62. Leaching of roasted zinc ore is done by
A Dilute H_2SO_4 B Concentrated H_2SO_4
C Dilute HCl D Dilute HNO_3

63. Seamless tube can be produced by
A Two high rolling mills B Ring rolling combined with stretch forming
C Piercing D Steam hammer forging

64. Ball mill is used for
A Crushing B Coarse grinding
C Fine grinding D Attrition

65. A minute surface or sub-surface crack present in a brass specimen may be tested by
A Visual inspection B Magnetic particle method
C Dye-penetration method D none of these

66. Cast Iron failure is of _____ type.
A Cup and cone B Top to Bottom
C Knife D Brittle

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 CuSO4
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. $\lim_{a\to b} \frac{a^b - b^a}{a^a - b^b}$ =

A $\frac{1 + logb}{1 - logb}$ B 0

C $\frac{1 - logb}{1 + logb}$ 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 B 64/3

C 128/3 D none

87. Changing the order of integration of $I = \int_0^2 \int_{x^2}^{2x} f(x,y)dydx$ leads to the integral $I = \int_r^s \int_p^q f(x,y)dydx$ the value of q is

A 0 B $y/2$

C $\sqrt{y}$ D 4

88. If $y(x) = x + \sqrt{x + \sqrt{x + \sqrt{x+\ldots\infty}}}$ then y(4) =

A $\frac{9+\sqrt{17}}{2}$ or $\frac{9-\sqrt{17}}{2}$ B $\frac{9-\sqrt{17}}{2}$only

C $\frac{9+\sqrt{17}}{2}$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 B -2

C -1 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 B 1

C $4xyi + 6yzj + 8xzk$ 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 $pq + (1-p)(1-q)$ B $(1-q)p$

C $(1-p)q$ D pq

92. The solution of $\frac{d^2y}{dx^2} - 25y = e^{3x}$ is

A $y = C_1 cos5x + C_2 sin5x + e^{3x}/16$ B $y = C_1 e^{5x} + C_2 e^{-5x} - e^{3x}/16$

C $y = C_1 e^{5x} + C_2 e^{-5x} + e^{3x}/16$ D $y = C_1 cos5x + C_2 sin5x - e^{3x}/16$

93. If $f(z) = u(x,y) + iv(x,y)$ is an analytics function of complex variable z then

A $u_x = v_y$, $u_y = v_x$ B $u_x = -v_y$, $u_y = -v_x$

C $u_x = -v_y$, $u_y = v_x$ D $u_x = v_y$, $u_y = -v_x$

94. The solution of $yy' + 25x = 0$ represents

A Family of circles B Family of ellipses

C Family of parabolas 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 B 2

C 4 D none

96. The inverse Laplace transforms of $\frac{1}{s(s+1)}$ is

A $sint$ B $e^{-t}sint$
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 $y^3-3x^2y+constant$ B $3x^2y-y^3+constant$
C $x^4-4x^3y+constant$ D $xy-y^2+constant$

98. If C is the simple closed curve around the origin then the value of $\oint_C \frac{sinz}{z}dz$

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 $x_{k+1}=\frac{(n-1){x_k}^n+\sqrt[n]{b}}{n{x_k}^{n-1}}$ B $x_{k+1}=\frac{(n-1){x_k}^n-\sqrt[n]{b}}{n{x_k}^{n-1}}$

C $x_{k+1}=\frac{(n-1){x_k}^n+b}{n{x_k}^{n-1}}$ D $x_{k+1}=\frac{(n-1){x_k}^n-b}{n{x_k}^{n-1}}$

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