SUB: METALLURGY ENGINEERING (MT)

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   Chemical metallurgy and physical
       metallurgy   metallurgy
    C Process metallurgy and chemical   Process metallurgy and material
       metallurgy   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 $CuSO_4$
   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. $\lim_{a\to b}\frac{a^b - b^a}{a^a - b^b} =$

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

    C $\dfrac{1-logb}{1+logb}$ D   e

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

MT

A	64	B	64/3
C	128/3	D	none

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

A $\quad$ 0 $\qquad\qquad$ B $\quad y/2$
C $\quad \sqrt{y}$ $\qquad\qquad$ D $\quad$ 4

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

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

C $\quad \frac{9+\sqrt{17}}{2}$only $\qquad$ D $\quad \infty$

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 $\quad$ -4 $\qquad\qquad$ B $\quad$ -2
C $\quad$ -1 $\qquad\qquad$ D $\quad$ 1

90. The curl of the gradient of the scalar field $v(x,y,z) = 2xyx^2 + 3xy^2z + 4xyz^2$ is

A $\quad$ 0 $\qquad\qquad$ B $\quad$ 1
C $\quad 4xyi + 6yzj + 8xzk$ $\qquad$ D $\quad 4xy + 6yz + 8xz$

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 $\quad pq + (1-p)(1-q)$ $\qquad$ B $\quad (1-q)p$
C $\quad (1-p)q$ $\qquad\qquad$ D $\quad pq$

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

A $\quad y = C_1\cos5x + C_2\sin5x + e^{3x}/16$ $\qquad$ B $\quad y = C_1e^{5x} + C_2e^{-5x} - e^{3x}/16$
C $\quad y = C_1e^{5x} + C_2e^{-5x} + e^{3x}/16$ $\qquad$ D $\quad y = C_1\cos5x + C_2\sin5x - e^{3x}/16$

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

A $\quad u_x = v_y, \qquad u_y = v_x$ $\qquad$ B $\quad u_x = -v_y, \quad u_y = -v_x$
C $\quad u_x = -v_y, \qquad u_y = v_x$ $\qquad$ D $\quad u_x = v_y, \quad u_y = -v_x$

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

A $\quad$ Family of circles $\qquad$ B $\quad$ Family of ellipses
C $\quad$ Family of parabolas $\qquad$ D $\quad$ 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 $\quad$ 1 $\qquad\qquad$ B $\quad$ 2
C $\quad$ 4 $\qquad\qquad$ D $\quad$ 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 nth 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