

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.	Frank-Read source			
	A	Hinders the movement of dislocation	B	Generates dislocation
	C	Is responsible for dislocation climb	D	Is responsible for polygonisation in edge dislocation
2.	Atoms per unit cell in FCC structure are			
	A	2	B	1
	C	8	D	4
3.	Specify the sequence correctly			
	A	Stress relief, grain growth, recrystallization	B	Stress relief, recrystallization, grain growth
	C	Grain growth, stress relief, recrystallization	D	Grain growth, recrystallization, stress relief
4.	The percentage of carbon in Steel varies from			
	A	0.008 to 2.0%	B	2.0 to 4.3%
	C	2.0 to 6.67%	D	0.0 to 1 %
5.	The cupola is used to manufacture			
	A	Cast Iron	B	Pig Iron
	C	Steel	D	Wrought Iron
6.	Substitutional solid solution forms, when the			
	A	Solute and solvent atoms possess almost equal diameters	B	Solute atoms are very small compared to solvent atoms
	C	Solvent atoms are very small compared to solute atoms	D	None of these
7.	Beryllium bronze contains			
	A	97.75% copper and 2.25% beryllium	B	80% copper and 20% beryllium

	C	60% copper and 40% beryllium	D	99% copper and 1% beryllium
8.	Thermoplastic materials are those materials which			
	A	Do not become hard with the application of heat and pressure and no chemical change occurs	B	Are flexible and can withstand considerable wear under suitable conditions
	C	Are formed into shape under heat and pressure and results in a permanently hard product	D	Are used as a friction lining for clutches and brakes
9.	The silicon steel is widely used for			
	A	Cutting Tools	B	Generators and transformers in the form of laminated cores
	C	Motor car Crankshaft	D	Connecting rods
10.	The lower critical temperature in °C for steels is			
	A	768	B	910
	C	723	D	1839
11.	Nickel in steel			
	A	Refines grain size and produces less tendency to carburisation, improves corrosion and heat resistant properties	B	Improves wear resistance, cutting ability and toughness
	C	Gives ductility, toughness, tensile strength and anti-corrosion properties	D	Improves cutting ability and reduces hardenability
12.	The following element can't impart high strength at elevated temperature			
	A	Nickel	B	Magnesium
	C	Manganese	D	Silicon
13.	The c/a ratio in hcp structure is			
	A	1.633	B	1.522
	C	2.011	D	1.902
14.	In crystal imperfections, the lattice sites from which atoms are missing, are called			
	A	Vacancies	B	Impurities
	C	Interstitialcies	D	Dislocations
15.	In austenitic stainless steel hardness and tensile strength can be increased by			
	A	Normalizing	B	Martempering
	C	Hardening and cold working	D	Full Annealing
16.	In bcc crystals the direction of close packed plane is			
	A	<010>	B	<100>
	C	<001>	D	<111>
17.	Which of the following is a line defect found in metal crystals?			
	A	Cracks	B	Grain boundaries

	C	Edge Boundaries	D	Edge dislocations
18.	The property which enables metals to be drawn into wire is known as			
	A	Ductility	B	Malleability
	C	Elastic deformation	D	Straining
19.	Pearlite is a combination of			
	A	Cementite and gamma iron	B	Ferrite and austenite
	C	Ferrite and cementite	D	Ferrite and iron graphite
20.	Pipes for bicycle frames are made of			
	A	Forged Steel	B	Hot rolled steel
	C	Cast Steel	D	Cold rolled steel
21.	Particles that most effects material properties			
	A	Protons	B	Neutrons
	C	Valence electrons	D	Electrons
22.	Excess of lime addition in basic steel making processes makes			
	A	The slag fluid	B	The slag viscous
	C	Hot heat	D	No change in slag viscosity
23.	Iron-carbon alloys containing carbon _____ 4.3% are known as hyper-eutectic cast irons.			
	A	Less than	B	Equal to
	C	More than	D	None of these
24.	Number of component (C), phase (P) and degrees of freedom (F) are related by Gibb's phase rule as			
	A	$C=P-F+2$	B	$P+F-C=2$
	C	$P=F-C-2$	D	$F=C-P-2$
25.	Usual casting method for making dental crowns			
	A	Die casting	B	Sand casting
	C	Investment casting	D	Continuous casting
26.	The composition of silver solder is			
	A	Silver, tin, nickel	B	Silver, copper, aluminium
	C	Silver, copper, zinc	D	Silver, lead, zinc
27.	Which one of the following elements is an austenite stabilizer?			
	A	Molybdenum	B	Nitrogen
	C	Tungsten	D	Vanadium
28.	Ductile cast iron			
	A	Is also known as chilled cast iron and is obtained by cooling rapidly. It is almost unmachinable	B	Is produced by annealing process. It is soft, tough and easily machined metal
	C	Is produced by small additions of magnesium (or creium) in the ladle. Graphite is in nodular or spheroidal form and is well dispersed throughout the material	D	Contains 1.7 to 3.5% carbon in Free State and is obtained by the slow cooling of molten cast iron
29.	Free cutting steels			

	A	Is used where rapid machining is the prime requirement	B	Can be cut freely
	C	Contain carbon in free form	D	Require minimum cutting force
30.	Crystal structure of a material is, generally, examined by			
	A	Metallurgical microscope	B	X-ray techniques
	C	Optical microscope	D	Magnifying Glass
31.	The riser is designed such that the melt in the riser solidifies			
	A	At the same time as casting solidifies	B	Before casting solidifies
	C	Irrespective of the solidification of the casting	D	After casting solidifies
32.	In compression, a prism of brittle material will break			
	A	By shearing along oblique plane	B	By forming a bulge
	C	By crushing into thousands of pieces	D	In direction perpendicular to application of load
33.	Smelting is the process of			
	A	Reducing the ore with carbon in the presence of a flux	B	Reducing the ore with carbon in the presence of a flux
	C	Expelling moisture, carbon dioxide, sulphur and arsenic from the iron ore by heating in shallow kilns	D	All of the above
34.	According to Indian standard specifications, plain carbon steel designated by 40 C8 means that the carbon content is			
	A	0.6 to 0.8%	B	0.35 to 0.45%
	C	0.4 to 0.6%	D	0.04%
35.	Hardenability of a steel is a measure of			
	A	Its Cementite content	B	Its carbon content
	C	The depth of toughness	D	The depth to which the steel will harden on quenching
36.	Hardest material so far found is			
	A	Graphite	B	Diamond
	C	Pumice stone	D	Carborundum
37.	How do crystals and amorphous solids differ?			
	A	Crystals have broad melting point ranges and amorphous solids do not.	B	Crystals produce regular shaped fragments when shattered and amorphous solids do not.
	C	Crystals have poorly formed patterns and amorphous solids do not.	D	Crystals have particles that are separated by irregular distances and amorphous solids do not.
38.	The addition of which of the following improves machining of copper?			
	A	Vanadium	B	Sulphur
	C	Tin	D	Zinc

39.	The ability of a material to absorb energy in the plastic range is called			
	A	Toughness	B	Fatigue strength
	C	Resilience	D	Creep
40.	What type of power source characteristic is required for manual welding?			
	A	Constant voltage	B	Motor Generator
	C	Drooping Characteristic	D	Flat Characteristic
41.	Presence of high phosphorous in cast iron increases its			
	A	Melting point	B	Fluidity
	C	Tensile strength	D	Shrinkage
42.	_____ is an ore of calcium			
	A	Siderite	B	Magnetite
	C	Gypsum	D	Malachite
43.	Addition of lead and bismuth to aluminium results in			
	A	One of the best known age and precipitation hardening systems	B	Improving machinability
	C	Improvement of casting characteristics	D	Improvement of casting characteristics
44.	Which of the following chemical elements has the greater effect on the harden ability of a steel plate?			
	A	Carbon	B	Molybdenum
	C	Titanium	D	Chromium
45.	Binary phase diagrams of two component systems are usually			
	A	two dimensional plots of temperature and composition	B	two dimensional plots of temperature and pressure
	C	two dimensional plots of pressure, temperature and composition	D	two dimensional plots of pressure and composition
46.	Siderite is an ore of			
	A	Silver	B	Copper
	C	Iron	D	Zinc
47.	Welding procedures may require welds to be deposited at a controlled rate heat input. High heat inputs would?			

	A	Have high hardness in the HAZ	B	Have poor profile
	C	Have low elongation properties	D	Have larger grain size
48.	Slag basicity (CaO/SiO_2) of L.D. slag is			
	A	0.5-1.0	B	0.01-0.05
	C	4.0-6.5	D	2-3.5
49.	What constituent is needed in coating of electrode of an electrode to prevent formation of porosity in welding of rimming steel?			
	A	Silicon	B	Iron powder
	C	Calcium carbonate	D	Calcium fluoride
50.	In friction welding, is the metal at the interface in the?			
	A	Plastic state	B	Liquid state
	C	Elastic state	D	Solid state
51.	A magnifying glass may be used during visual inspection but BS 5289 states that its magnification should be:			
	A	5 – 10 X	B	Up to 5X
	C	Upto 4X	D	2 – 2.5 X
52.	Submerged arc fluxes can be supplied in two forms; these are?			
	A	Sintered and agitated	B	Crushed and agglomerated
	C	Agitated and fused	D	Fused and agglomerated
53.	Corrosion resistance of steel is increased by adding			
	A	Nickel and molybdenum	B	Tungsten and Sulphur
	C	Chromium and nickel	D	Aluminium and zinc
54.	Cracks in welds may be due to			
	A	Solidification problems	B	Excessive stresses
	C	Hydrogen problems	D	All of the above
55.	MIG welding tends to be susceptible to lack of fusion problems			
	A	Poor maintenance of equipment	B	Incorrect setting
	C	Poor inter run cleaning	D	All of the above
56.	Tungsten in high speed steel provides			
	A	Wear resistance	B	Toughness

	C	Hot hardness	D	Sharp cutting edge
57.	A fatigue failure characteristic by the appearance of the fracture surface. It would be			
	A	Smooth	B	Rough and torn
	C	“Cheveron” – like	D	Dimple
58.	The process of heating the ore strongly in excess of air so that the volatile impurities are removed and the ore is changed to oxide is known as			
	A	Roasting	B	Calcination
	C	Leaching	D	Froth floatation
59.	Temperature of blast furnace gas (top gas) emanating from blast furnace is about.....°C			
	A	200-250	B	80-100
	C	600-750	D	350-500
60.	Solder is an alloy consisting of			
	A	Lead and zinc	B	Tin and lead
	C	Tin and copper	D	Tin, antimony, copper
61.	Basic constituents of Monel metal are			
	A	Nickel, molybdenum	B	Nickel, Copper
	C	Nickel, lead and tin	D	Zinc, tin, lead
62.	Hydrometallurgy of Copper extraction			
	A	Is applied to very poor oxidized Ore	B	Involves crushing, washing leaching & precipitation of Ore.
	C	Is the cheapest of all methods	D	All (A), (B) & (C)
63.	Weld decay is the phenomenon found with			
	A	Stainless steel	B	Mild steel
	C	Nonferrous materials	D	Cast iron
64.	Induction hardening is the process of			
	A	Heating and cooling rapidly	B	Inducing hardness by continuous process
	C	Hardening surface of work-piece to obtain hard and wear resistant surface	D	Increasing hardness throughout
65.	Froth floatation method may be used to increase the concentration of mineral in			
	A	Bauxite	B	Chalcopyrites
	C	Calamine	D	Hematite
66.	In lost wax process, ----- is made of wax.			
	A	Pattern	B	Mould
	C	Coating material	D	Only sprue
67.	----- arc welding employs consumable electrodes.			
	A	TIG	B	MIG
	C	Carbon	D	Submerged

68.	The ability of a material to withstand repeatedly applied stress is determined by ----- test.			
	A	Creep	B	Impact
	C	Brinell hardness	D	Fatigue
69.	Red or reddish black iron ore contains mainly			
	A	hematite	B	Magnetite
	C	carbonate	D	Limonite
70.	Burger's vector changes with			
	A	Kind of dislocation	B	Kind of dislocation
	C	Both kind and length of dislocation	D	None
71.	Which is a basic oxygen furnace (BOF)?			
	A	LD converter	B	Bessemer converter
	C	Basic open hearth furnace	D	None of these
72.	Tapping temperature of steel depends upon the			
	A	Holding time of the melt in the ladle before teeming starts and the teeming practice	B	Amount of additions to be made in ladle
	C	Chemical composition of the steel melt	D	Above all
73.	Which is the most stable oxide product during refining of pig iron?			
	A	CaO	B	SiO ₂
	C	MgO	D	MnO
74.	Permeability of the charge in the bosh region of the blast furnace is maintained by			
	A	coke	B	Sinter
	C	limestone flux	D	iron ore
75.	Maximum permissible % of P in plain carbon steel is _____%.			
	A	0.05	B	0.01
	C	1.0	D	0.5
76.	The pyro Metallurgical process used for the extraction of Mg is called ____			
	A	Bayer's	B	Pidgeon
	C	Hoop's	D	Mond
77.	Figure out the odd statement about ceramics in the following			

	A	Contains both metallic and nonmetallic elements	B	Usually less desirable than metals
	C	Ductile in nature	D	Good insulators of heat and electricity
78.	Conversion of calcined alumina to aluminium by electrolysis is done in a			
	A	Concrete chamber	B	Carbon lined furnace
	C	Stainless steel chamber	D	Wooden chamber
79.	Which one of the following techniques does NOT require quenching to obtain final case hardness?			
	A	Induction hardening	B	Flame hardening
	C	Carburizing	D	Nitriding
80.	Which one of the following can give information about the corrosion rate?			
	A	Polarization technique	B	Pourbaix diagram
	C	Galvanic series	D	EMF series
81.	The sum and the product of the eigen values of matrix $A = \begin{bmatrix} 2 & -3 \\ 4 & -2 \end{bmatrix}$ are ____ and ____ respectively.			
	A	0, -16	B	4, 8
	C	0, 16	D	0, 8
82.	Which of the following has rank 1?			
	A	$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$	B	$\begin{bmatrix} 1 & 2 \\ -2 & 4 \end{bmatrix}$
	C	$\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$	D	$\begin{bmatrix} 1 & -3 \\ -2 & 4 \end{bmatrix}$
83.	Which of the following is an eigen vector of the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$?			
	A	(1, 1)	B	(1, 4)
	C	(4, 1)	D	(4, 4)
84.	$\lim_{x \rightarrow \infty} \left(a^{\frac{1}{x}} - 1 \right) x = \text{_____}$			
	A	$\ln a$	B	$\ln(1/a)$
	C	$-\ln a$	D	None of above
85.	Which of the following is a stationary point of the function $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$?			
	A	(0, 0)	B	(0, 4)

	C	(4, 0)	D	(4, 4)
86.	Find the equation of the tangent plane to the surface $x^2 + y^2 + z^2 = 5$ at the point (1,1,1) .			
	A	$x + y + z = 0$	B	$2x + 2y + 2z = 3$
	C	$x + y + z = 3$	D	$2x + 2y + 2z = 0$
87.	A vector field is said to be irrotational, if _____			
	A	$\text{grad } \bar{F} = 0$	B	$\text{div } \bar{F} = 0$
	C	$\text{curl } \bar{F} \neq 0$	D	$\text{curl } \bar{F} = 0$
88.	The general solution of the differential equation $(D^2 + 9)y = 0$			
	A	$y = c_1 e^{3x} + c_2 e^{-3x}$	B	$y = e^{3x} (c_1 \cos 3x + c_2 \sin 3x)$
	C	$y = c_1 \cos 3x + c_2 \sin 3x$	D	None of these
89.	Laplace transform of $t^3 e^{-3t}$ is _____			
	A	$\frac{2}{(s+4)^4}$	B	$\frac{2}{(s+3)^4}$
	C	$\frac{6}{(s+3)^4}$	D	$\frac{6}{(s+4)^4}$
90.	The inverse Laplace transform of $\frac{2s+1}{s(s+1)}$ is _____			
	A	$e^{-t} + 1$	B	e^{-t}
	C	te^{-t}	D	None of these
91.	The probability of impossible event is _____.			
	A	0	B	1
	C	0.5	D	Not defined
92.	Determine the interval within which root of the equation $x^2 - 36 = 0$ lies.			
	A	(0,5)	B	(2,4)
	C	(3,7)	D	(-5,-4)
93.	Which of the following is true for $f(z) = \sin z$?			
	A	Continuous and differentiable	B	Continuous but not differentiable
	C	Differentiable but not continuous	D	Neither differentiable nor continuous
94.	$\int_{x_0}^{x_6} f(x) dx = \frac{h}{2} (f(x_0) + f(x_6) + 2(f(x_1) + f(x_2) + f(x_3) + f(x_4) + f(x_5)))$ is _____ formula to evaluate the numerical integration.			

	A	Trapezoidal rule	B	Simpson's 1/3 rule
	C	Simpson's 3/8 rule	D	None of these
95.	The mean and variance of binomial probability distribution are 4 and 3 respectively, then the probability of getting exactly six successes in the distribution is _____			
	A	$12C_6 \left(\frac{1}{4}\right)^{10} \left(\frac{3}{4}\right)^6$	B	$16C_6 \left(\frac{1}{4}\right)^6 \left(\frac{3}{4}\right)^{10}$
	C	$16C_6 \left(\frac{1}{4}\right)^{10} \left(\frac{3}{4}\right)^6$	D	$12C_6 \left(\frac{1}{4}\right)^6 \left(\frac{3}{4}\right)^6$
96.	Evaluate $\oint_C \frac{e^{-z}}{z+1} dz$ where C is the circle $ z =2$.			
	A	0	B	1
	C	2π	D	$2\pi e$
97.	For the function $\frac{1-e^{2z}}{z^4}$ which of the following is true?			
	A	$z=0$ is simple pole	B	$z=0$ is the pole of order 2
	C	$z=i$ is zero of order 3	D	$z=0$ is the pole of order 3
98.	In usual notations, for given probability distribution if $E(X)=5$ then $E(2X+9)=$ _____			
	A	10	B	19
	C	9	D	55
99.	Find the auxiliary quantity k_1 using Runge-Kutta second order method for the differential equation $y' = x - y^2$ with $y(0)=1$ and $h=0.1$.			
	A	0.1	B	-0.1
	C	0	D	1
100.	Solve the differential equation $2xydx + x^2dy = 0$ and find out its general solution.			
	A	$x^2y = c$	B	$xy^2 = c$
	C	$x^2 + y = c$	D	None of these
