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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: III - THEORY EXAMINATION (2021 - 2022) (ONLINE)

Subject: Materials Science and Engineering

Time: 02:00 Hours

Max. Marks: 100

General Instructions:

1. All questions are compulsory. It comprises of two Sections A and B.
 - Section A - Question No- 1 has 35 objective type questions carrying 2 marks each.
 - Section B - Question No- 2 has 12 subjective type questions carrying 3 marks each. You have to attempt any 10 out of 12 question.
 - No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.

SECTION A

35 x 2 = 70

1. Attempt ALL parts:-

- | | | |
|-------|---|---|
| 1.1.a | An example of amorphous material is | 1 |
| | (a) Zinc | |
| | (b) Lead | |
| | (c) Silver | |
| | (d) Glass | |
| 1.1.b | Which of the following factors is more relevant to represent complete solubility of two metals in each other? | 1 |
| | (a) Chemical affinity | |
| | (b) Valency factor | |
| | (c) Crystal structure factor | |
| | (d) Relative size factor | |
| 1.1.c | There is no end-centred cubic space lattice, because | 1 |
| | (a) it can be represented by the simple cubic lattice | |
| | (b) it can be represented by the simple orthorhombic lattice | |
| | (c) it violates the cubic symmetry | |
| | (d) none of these | |
| 1.1.d | The tetragon has | 1 |
| | (a) 4 faces | |
| | (b) 12 edges | |
| | (c) 6 corners | |
| | (d) 8 edges | |
| 1.1.e | In a tensile test, necking starts at | 1 |
| | (a) lower yield stress | |
| | (b) upper yield stress | |
| | (c) ultimate tensile stress | |
| | (d) just before fracture | |
| 1.1.f | Crystal structure of Copper is Body Centred Cubic Structure | 1 |
| | (a) TRUE | |
| | (b) FALSE | |

1.1.g	Atoms are arranged in face centred cubic structure as all eight corners of the cube and at the centre of each face. (a) TRUE (b) FALSE	1
1.2.a	Gibb's phase rule is given by ($F = \text{no. of DOF}$, $C = \text{no. of components}$, $P = \text{no. of phases}$) (a) $F = C + P$ (b) $F = C + P + 2$ (c) $F = C - P - 2$ (d) $F = C - P + 2$	1
1.2.b	Pearlite consists of (a) 6.67% C and 93.33% ferrite (b) 12% Fe and 87% cementite (c) 13% C and 87% ferrite (d) 13% cementite and 87% ferrite	1
1.2.c	Increase of ferrite phase in steel increases (a) strength (b) hardness (c) ductility (d) brittleness	1
1.2.d	Which of the following phase of steel is not present in Iron-Carbon phase diagram? (a) Ferrite (b) Cementite (c) Austenite (d) Martensite	1
1.2.e	The hardness of steel increases if it contains ferrite. (a) TRUE (b) FALSE	1
1.2.f	The temperature at which new stress-free grains are formed in the metal is called, recrystallization temperature. (a) TRUE (b) FALSE	1
1.2.g	Eutectic reaction results in the formation of mixture of solid and liquid phases (a) TRUE (b) FALSE	1
1.3.a	It is most difficult to visualize the process of diffusion in (a) Solid (b) Liquid (c) Gas (d) Vapour	1
1.3.b	The error function of 0 is (a) -1 (b) 0 (c) 1 (d) infinite	1
1.3.c	Francium (Fr) of atomic number 87 melts at 27 degree C. It is worked at -100 degree C. The working process will be known as	1

	(a) cold working	
	(b) hot working	
	(c) cold-hot transition	
	(d) tempering	
1.3.d	Calcium carbonate is used in the case of	1
	(a) hardening	
	(b) cyniding	
	(c) tempering	
	(d) nitriding	
1.3.e	What is necessary to be done before the nitriding process?	1
	(a) Heat Treatment	
	(b) Washing the material	
	(c) Chamfering of sample	
	(d) Shaping of material	
1.3.f	The coefficient of diffusion increases with decreases in temerature.	1
	(a) TRUE	
	(b) FALSE	
1.3.g	Precipatate paricles in a metal becomes smaller at lower temerature.	1
	(a) TRUE	
	(b) FALSE	
1.4.a	Not an example for actuator	1
	(a) Optical fiber	
	(b) Shape memory alloys	
	(c) Magneto-strictive materials	
	(d) Electro-/Magneto-rheological fluids	
1.4.b	Strong and ductile materials	1
	(a) Polymers	
	(b) Ceramics	
	(c) Metals	
	(d) Semiconductors	
1.4.c	Magnetic susceptibility of a material is -1. It belongs to the kind of solid known as	1
	(a) ferrite	
	(b) superconductor, type I	
	(c) antiferromagnetic	
	(d) garnet	
1.4.d	The magnetic lines of force are repelled back completely due to an effect called	1
	(a) BCS effect	
	(b) Silsbee effect	
	(c) Meissner effect	
	(d) Bednoz effect	
1.4.e	Which of the following is not an effect of adding boron and silicon to superalloys?	1
	(a) Improves adhesion	
	(b) Maintains oxide layer	
	(c) Increases spalling	
	(d) Reduces spalling	
1.4.f	Composite materials are classified based on	1

	(a) Type of matrix	
	(b) Size-and-shape of reinforcement	
	(c) Both	
	(d) None	
1.4.g	Piezoelectric materials are non-conductive.	1
	(a) TRUE	
	(b) FALSE	
1.5.a	X rays are	1
	(a) deflected by an electric field but not by a magnetic field	
	(b) deflected by a magnetic field but by an electric field	
	(c) not deflected by an electric or a magnetic field	
	(d) deflected by both a magnetic field and an electric field	
1.5.b	X-Ray can be deflected by	1
	(a) electric field	
	(b) magnetic field	
	(c) electromagnetic field	
	(d) none of the fields	
1.5.c	Which of the following techniques are used in Transmission Electron Microscopy (TEM) for examining cellular structure?	1
	(a) Negative-Staining	
	(b) Shadow Casting	
	(c) Ultrathin Sectioning	
	(d) All of the above	
1.5.d	X-rays are the second most energetic radiations in the electromagnetic spectrum following gamma rays.	1
	(a) TRUE	
	(b) FALSE	
1.5.e	X-rays are widely used in medical diagnosis and astronomy.	1
	(a) TRUE	
	(b) FALSE	
1.5.f	X-rays are deflected by a magnetic field but by an electric field.	1
	(a) TRUE	
	(b) FALSE	
1.5.g	As the applied voltage increases, the minimum wavelength of X-radiation from a metal decreases.	1
	(a) TRUE	
	(b) FALSE	

SECTION B

10 X 3 = 30

2. Answer any TEN of the following:-

2.1.a	What do you understand by term 'crystal lattice'?	2
2.1.b	Differentiate between crystalline and non-crystalline structure.	2
2.2.a	Differentiate between hot and cold working.	2
2.2.b	What are the disadvantages of cold working of metal?	2
2.2.c	Differentiate between peritectoid and peritectic.	2
2.3.a	What are the limitations of Fick's laws?	2
2.3.b	Why is heat treatment imparted to steel?	2

2.3.c	What are the objective of tempering?	2
2.4.a	What are the applications of biomaterials?	2
2.4.b	Classify superconductors.	2
2.5.a	How SEM is differ from FESEM?	2
2.5.b	Which microscope is often used to view metal surfaces?	2