Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **14ME2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MATERIAL SCIENCE AND ENGINEERING** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | | | | **Course outcome** | **Marks** |
| **PART-A (40X1=40 MULTIPLE CHOICE QUESTIONS)** | | | | | | |
| 1. | Atomic number equals | | | | CO1 |  |
|  | a. The number of protons in the nucleus | b. The number of electrons in a cation | c. The number of neutrons in the nucleus | d. The number of atoms in a mole of atoms |  | (1) |
| 2. | A metallic bond forms by | | | | CO1 |  |
|  | a. Transferring of an electron from one atom to another | b. Sharing an electrons between two atoms | c. Sharing electrons among all atoms | d. None |  | (1) |
| 3. | Malleability is the property of the material due to which it | | | | CO1 |  |
|  | a. Can be rolled or hammered into thin sheets | b. Can be drawn into wires | c. Breaks with little permanent distortion | d. Can cut another material |  | (1) |
| 4. | Repeatable entity of a crystal structure is known as | | | | CO1 |  |
|  | a. Crystal | b. Lattice | c. Unit cell | d. Miller indices |  | (1) |
| 5. | Scanning electron microscopy (SEM) is best used to study | | | | CO1 |  |
|  | a. Small internal cell structures. | b. Surface morphology. | c. All | d. None |  | (1) |
| 6. | Transmission electron microscopy is best for high magnification viewing of | | | | CO1 |  |
|  | a.Internal structure of fixed cells. | b. Internal structure of live, motile cells. | c. Surface structure of fixed cells. | d. Surface membranes of live, motile cells. |  | (1) |
| 7. | "TEM" refers to a photomicrograph taken by a \_\_\_\_\_\_. | | | | CO1 |  |
|  | a. Light microscope | b. Triple emission microscope | c.Telephoto electroplating machine | d. Transmission electron microscope |  | (1) |
| 8. | The ability of a given substance to assume two or more crystalline structure is called | | | | CO2 |  |
|  | a. Polymorphism | b. . Isomorphism | c. Amorphous | d. Isomerism |  | (1) |
| 9. | A photograph which is taken from a microscope is called | | | | CO2 |  |
|  | a. Photograph | b. Micrograph | c. Diagraph | d. Graph |  | (1) |
| 10. | Resolution of electron microscope is | | | | CO2 |  |
|  | a. 0.1 nm | b. 0.2nm | c. 10nm | d. 20nm |  | (1) |
| 11. | Fick’s II law explains | | | | CO2 |  |
|  | a. Dislocation movement | b. Defects in solids | c. That under non-steady state conditions flux changes with time and position along the diffusion direction | d. How diffusion happens from larger to smaller concentration |  | (1) |
| 12. | Brass is an alloy of \_\_\_\_\_\_\_\_ | | | | CO2 |  |
|  | a. Copper and Tin | b. Copper, Zinc | c. Zinc and Tin | d. None |  | (1) |
| 13. | Smaller grains will make the material | | | | CO2 |  |
|  | a. Weaker | b. Stronger | c. Smaller | d. Defective |  | (1) |
| 14. | Slip planes get disoriented at the grain boundaries. This -------dislocations | | | | CO2 |  |
|  | a. Reduces the number of | b. Changes the direction of motion of | c. Destroys | d. Does not affect |  | (1) |
| 15. | Work hardening\_\_\_\_\_\_ | | | | CO2 |  |
|  | a. Enhances yield strength of the material | b. Decreases ductility of the material | c. Decreases the cross sectional area of the material | d. All |  | (1) |
| 16. | Larger solute atoms cause | | | | CO2 |  |
|  | a. Tensile stresses | b. Compressive stresses | c. No effect | d. Both ‘A’ and ‘B’ are correct |  | (1) |
| 17. | Steel generally contains | | | | CO2 |  |
|  | a. 0.05-2.0 wt. % carbon | b. More than 2 wt. % carbon | c. Up to 6.67 wt % carbon | d. No carbon |  | (1) |
| 18. | Tool steels contain | | | | CO2 |  |
|  | a. 0.9 to 2.0 % Carbon | b. 0.6 to 0.8 % Carbon | c. 0.25 to 0.55 % Carbon | d. < 0.20 % Carbon |  | (1) |
| 19. | Addition of impurities to pure metals | | | | CO1 |  |
|  | a. Improves properties | b. Should be avoided | c. Weakens the metal | d. Is not a feasible process |  | (1) |
| 20. | Addition of chromium to steel | | | | CO1 |  |
|  | a. Increases corrosion and oxidation resistance | b. Makes steel brittle | c. Improves magnetic properties | d. All |  | (1) |

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| 21. | Boundary line between (liquid) and (liquid + solid) region is | | | | CO1 |  |
|  | a. Liquidus | b.Phase diagram | c.Solidus | d. Eutectic line |  | (1) |
| 22. | A liquid phase produces two solid phases during | | | | CO1 |  |
|  | a.Eutectic | b.Peritectic | c.Monotectic | d.Eutectoid |  | (1) |
| 23. | Gibbs phase rule is | | | | CO1 |  |
|  | a.p+f=c+2 | b.p+f=c+1 | c.p+f=c-2 | d.p+f=c-1 |  | (1) |
| 24. | Complete solubility occurs between Cu and Ni. It is an example of | | | | CO1 |  |
|  | a.Isomorphous | b. Homologous | c. Heterologous | d. Homogenous |  | (1) |
| 25. | Upon equilibrium, melting begins at | | | | CO1 |  |
|  | a. Solidus line | b. Liquidus line | c. Interline | d. Melting line |  | (1) |
| 26. | Horizontal line drawn from liquid phase boundary to solid phase boundary is | | | | CO1 |  |
|  | a. Boundary line | b. Tie line | c. Closed line | d. Phase line |  | (1) |
| 27. | Solder is an alloy of | | | | CO2 |  |
|  | a. Pb and Sb | b. Pb and Sn | c. Ti and Sn | d. Ti and Pb |  | (1) |
| 28. | Weight fraction of phase is given by the formula | | | | CO2 |  |
|  | a. Same phase distance /total tie line length | b. Opposite phase distance/total tie line length | c. Total tie line length/same phase distance | d. Total phase distance/opposite phase distance |  | (1) |
| 29. | Which rule represents the condition under which elements could dissolve in a metal? | | | | CO2 |  |
|  | a. Lever | b. Hume Rothery | c. Gibbs | d. Phase |  | (1) |
| 30. | If number of components is 3,number of phases is 2 then what is the degree of freedom? | | | | CO2 |  |
|  | a. 2 | b. 1 | c. 3 | d. 4 |  | (1) |
| 31. | The process of formation of new grains is known as | | | | CO2 |  |
|  | a. Pre-crystallization | b. Re-crystallization | c. Crystallization | d. Post-crystallization |  | (1) |
| 32. | The hot working of metal, is accomplished at | | | | CO2 |  |
|  | a. Below recrystallization temperature | b. Above recrystallization temperature | c. Recrystallization temperature | d. All |  | (1) |
| 33. | The units for diffusivity, D, are | | | | CO2 |  |
|  | a. m²sec | b. m²/sec | c. 1/m²sec | d. sec/m² |  | (1) |
| 34. | Diffusion can occur in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ materials. | | | | CO2 |  |
|  | a. Solid | b. Liquid | c. Gaseous | d. All |  | (1) |
| 35. | Cleavage fracture appears | | | | CO2 |  |
|  | a. Bright | b. Dull | c. Difficult to identify | d. None |  | (1) |
| 36. | Usually materials with following crystal structure fail in ductile mode | | | | CO2 |  |
|  | a. FCC | b. BCC | c. HCP | d. None |  | (1) |
| 37. | Fracture toughness is measured in terms of | | | | CO2 |  |
|  | a. Strain energy release rate | b. Stress concentration factor | c. Both | d. None |  | (1) |
| 38. | Most often machine components fail by | | | | CO2 |  |
|  | a. Buckling | b. Creep | c. Fatigue | d. All |  | (1) |
| 39. | Fracture voids usually form at | | | | CO2 |  |
|  | a. Inclusions | b. Second phase particles | c. Grain boundary triple points | d. All |  | (1) |
| 40. | In fracture mode-II, fracture surfaces | | | | CO1 |  |
|  | a. Shear parallel to edge of crack | b. Shear perpendicular to edge of crack | c. Displace normal to each other | d. None |  | (1) |

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| **PART B(8 X 5 = 40 MARKS) (ANSWER ANY EIGHT)** | | | |
| 41. | Define metallography. Explain the various steps in metallographic analysis. | CO1 | (5) |
| 42. | Explain polymorphism with examples. | CO1 | (5) |
| 43. | How do ‘Imperfections’ come about in metallic structure? Are they desirable? | CO1 | (5) |
| 44. | Would you allow the ‘dislocations’ in a crystal structure to move about or slide freely? Justify your answer. | CO1 | (5) |
| 45. | Illustrate with neat sketches the theory governing the movement of dislocations | CO1 | (5) |
| 46. | Why strain hardening also called cold working? | CO1 | (5) |
| 47. | Explain recrystallization in detail. | CO2 | (5) |
| 48. | Draw the plastic deformation by slip. | CO2 | (5) |
| 49. | Define the Fatigue failure with suitable example. | CO2 | (5) |
| 50. | What are the factors affecting the Creep characteristics of metals. | CO2 | (5) |
| **PART C( 2 X 10 = 20 MARKS) (ANSWER ANY TWO)** | | | |
| 51. | Sketch neatly a metallurgical microscope. Explain its construction and operation. | CO1 | (10) |
| 52. | Define the term “Hardanability” and briefly explain “The Jominy End-Quench Test”. | CO2 | (4+6) |
| 53. | Explain creep in ceramic and polymeric materials . | CO2 | (10) |

ALL THE BEST