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Total Number of Pages : 2

AR-18

B.TECH

**B.TECH 3<sup>rd</sup> SEMESTER EXAMINATIONS, NOV/DEC 2019**  
**BMEPC3030****INTRODUCTION TO PHYSICAL METALLURGY & ENGINEERING MATERIALS**

Mechanical Engineering

Time : 3 Hours

Maximum : 100 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

**PART – A: (Multiple Choice Questions) 10 x 2=20 Mark**Q.1. Answer All Questions

- a ----- is not a pure metal. [CO1] [PO1]  
(a) Silver (b) Copper (c) Nickel (d) Brass
- b The crystal structure of Steel is ..... [CO1] [PO1]  
(a) BCC (b) FCC (c) HCP (d) SC
- c ..... grains are formed in the core of ingots. [CO1] [PO1]  
(a) Acicular (b) columnar
- d The solid solutions occur as ..... solid solution and interstitial solid solution. [CO2] [PO1]  
(a) Substitutional (b) interstitial (c) All the above (d) None of these.
- e The intermediate phase are formed when chemical affinity between two metals is ..... [CO2] [PO2]  
(a) equal (b) greater (c) lesser (d) no affinity
- f In ..... reaction upon cooling a liquid phase two solid phases are formed and it is reversible [CO3] [PO2]  
upon heating.  
(a) Eutectic reaction (b) Eutectoid reaction (c) Peritectic reaction (d) Peritectoid reaction.
- g The carbon content of gray cast irons is between 2.5 to ..... wt%. [CO3] [PO1]  
(a) 4% (b) 6% (c) 4.5% (d) 6.2%
- h ..... is a solid state laser [CO4] [PO1]  
(a) HeCd (b) Ruby (c) Diode (d) He Ne
- I The fiber glass is composed mainly of ..... [CO4] [PO1]  
(a) SiO<sub>2</sub> (b) Al<sub>2</sub>O<sub>3</sub> (c) CaO (d) MgO
- j Point defects in a crystal structure are ..... [CO1] [PO1]  
(a) Vacancy (b) interstitialcy (c) frenkel defect (d) All the above.

**PART – B: (Short Answer Questions) 10X2=20 Marks****Q.2. Answer All questions**

- a Define crystal structure. [CO1] [PO1]
- b Define Polymorphism. [CO1] [PO1]
- c Define APF. [CO1] [PO1]
- d Explain the factors governing solid solubility. [CO2] [PO2]
- e Write short note on Peritectoid system [CO2] [PO1]
- f Explain annealing process. [CO3] [PO2]
- g Write a note on High Speed Steel. [CO3] [PO1]
- h Give the classification of Cast Irons. [CO3] [PO1]
- I List the applications of Optic fibers. [CO4] [PO1]



- j Give the properties of Teflon and its applications [CO4] [PO1]

**PART – C: (Long Answer Questions) 4X15=60 Marks**

**Answer ALL questions**

Q.3

- a Classify materials based on their engineering applications 8 [CO1] [PO1]  
b Discuss about the crystal systems with suitable illustrations 7 [CO1] [PO1]

OR

- c Explain in detail the crystal imperfections. 8 [CO1] [PO2]  
d Find the number of atoms associated in each BCC, FCC and HCP unit cells. Calculate the equilibrium number of vacancies per cubic meter for copper at 100 o C. The energy for vacancy formation is 0.9 eV/atom; the atomic weight and density for copper are 63.5 g/mol and 8.45 g/cm<sup>3</sup>, respectively. Take Avogadro's number as  $6.023 \times 10^{23}$  atoms/mol.  $k=8.62 \times 10^{-5}$  eV/atom. 7 [CO1] [PO2]

Q.4

- a Describe the solid solution in Steel. 8 [CO2] [PO1]  
b Discuss the classification of equilibrium diagram in detail. 7 [CO2] [PO1]

OR

- c Explain the Iron Carbon equilibrium diagram with suitable illustrations. 9 [CO2] [PO2]  
d Discuss the dendritic segregation in metals. 6 [CO2] [PO1]

Q.5

- a The tensile stress on a single crystal of BCC iron lies along [010] direction. If the tensile stress of 52 MPa is applied, Calculate the resolved shear stress along (110) plane and in [-1 1 1] direction. If slip occurs on (110) plane and [-1 1 1] direction and CRSS is 30 MPa, calculate the applied tensile stress to cause yielding. 6 [CO3] [PO1]  
b Describe the procedure of constructing a T.T.T diagram. 9 [CO3] [PO2]

OR

- c Explain the procedure for testing the hardenability of steel. 8 [CO3] [PO1]  
d Explain the applications of cast iron and its demerits. 7 [CO3] [PO1]

Q.6

- a Distinguish between thermosetting and thermo plastics. 8 [CO4] [PO1]  
b Discuss the effect of agglomeration on properties of composites. 7 [CO4] [PO1]

OR

- c Discuss the process of producing metal matrix composites. 8 [CO4] [PO1]  
d Explain the applications of composites and their advantages. 7 [CO4] [PO1]