POLYTECHNIC, B.E/B.TECH, M.E/M.TECH, MBA, MCA & SCHOOL

Notes   *Available @*
Syllabus
Question Papers   www.binils.com
Results and Many more…

Reg. No. :

Question Paper Code : 91142

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022

Second Semester

Aeronautical Engineering

PH 8251 – MATERIALS SCIENCE

(Common to : Aerospace Engineering/Automobile Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Mechanical Engineering/Mechanical Engineering (Sandwich)/Mechanical and Automation Engineering/Mechatronics Engineering/Production Engineering/Robotics and Automation)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write Gibbs phase rule with an example.

2. How do you identify a phase change of a system with a cooling curve?

3. Mention the eutectoid reaction equation and temperature at which pearlite microstructure forms.

4. Brief tempering of martensite.

5. Compare slip and twinning process.

6. How Creep resistance can be improved in polycrystalline materials?

7. Differentiate hard and soft magnetic materials.

8. What are high temperature superconductors?

9. List the two common matrix materials used in fiber reinforced plastics.

10. What are shape memory alloys?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain binary eutectic alloy systems using Lead Tin phase diagram. (8)

   (ii) Draw phase diagrams to show the formation of microstructure at various temperatures and compositions in the phase diagram. (8)

Or

   (b) Explain binary peritectic alloy system using Platinum-Silver phase diagram. (16)

12. (a) (i) Draw the Iron-Carbon phase diagram and explain the different phases of iron and steel formed in it. (8)

   (ii) Draw the microstructure of eutectoid steel, hypo and hyper eutectoid steels and Explain. (8)

Or

   (b) Explain phase transformation and TTT diagrams of eutectoid steel using suitable theory of nucleation. (16)

13. (a) Explain Ductile and Brittle Fracture Mechanisms. Describe the brittle fracture phenomenon using Griffith's criterion and theory. (16)

Or

   (b) How the fatigue tests are conducted? Derive an expression for fatigue crack propagation rate and deduce equations that explains the S-N curve. (16)

14. (a) Explain the domain theory of ferromagnetism and the types of energy involved in ferromagnetic materials. (16)

Or

   (b) Formulate expressions for electronic, ionic and orientational polarization and obtain Langevin-Debye Equation for dielectric materials. (16)

15. (a) Describe how metallic glasses are synthesized and processed. What are their properties and applications? (16)

Or

   (b) How are nanomaterials prepared? Explain with an example the properties and applications of nanomaterials. (16)

—————————