Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40064

B.E. DEGREE EXAMINATION, APRIL/MAY 2018
Second Semester
Aeronautical Engineering
PH 8251 : MATERIALS SCIENCE

(Common to 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 Engineering)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Define Hume Rothery's Empirical rules for the substitutional solid solutions.
2. What is the maximum number of phases that can coexist in equilibrium in a three component system ?
3. Calculate the atomic percent of carbon in mild steel containing 0.2 wt% of carbon.
4. Define Fick's law of diffusion.
5. What is meant by slip plane system ?
6. What is meant by CRSS ?
7. Distinguish between hard and soft magnetic materials.
8. Define the electronic polarizability of an atom.
9. What are the different types of ceramics ?
10. What are composites ?

PART – B

(5×16=80 Marks)

11. a) Explain in detail the different phases in a eutectic phase diagram with their microstructural changes on cooling. (16)

(OR)

b) i) What are the applications of lever rule ? (3)

ii) Explain in detail the different phases in a peritectic phase diagram. (13)

12. a) i) Distinguish between hypo and hypereutectoid steels. (4)

ii) Describe in detail the different microstructures of slowly cooled steel. (12)

(OR)

b) Explain in detail the different transformations (Pearlitic, baintic and martensitic) of a eutectoid steel with a suitable T-T-T diagram. (16)

13. a) Describe in detail the different strengthening methods for a deformed material. (16)

(OR)

b) Describe in detail the different hardness measurements using Rockwell, Brinell, Knoop and Vickers hardness for a solid material. (16)

14. a) Derive an expression for the Langevin-Debye equation. (16)

(OR)

b) i) Explain in detail the different types of breakdowns in a dielectric medium. (8)

ii) Explain in detail the effect of temperature and magnetic field on the properties of superconductors. (8)

15. a) Describe in detail the development, properties and applications of metallic glasses. (16)

(OR)

b) i) Explain in detail the preparation of nanomaterials by bottom up processes. (12)

ii) What are the different types of carbon nanotubes and state their properties ? (4)