Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

05/06/18

Question Paper Code : 40064

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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 ?

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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)

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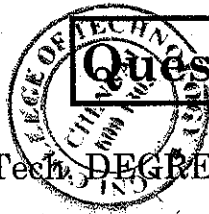
Question Paper Code : 90497

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Second Semester

Mechanical Engineering

PH 8251 – MATERIALS SCIENCE

(Common to Aeronautical Engineering/Aerospace Engineering/Automobile Engineering/Industrial Engineering/Industrial Engineering and Management/ Manufacturing Engineering/Marine 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. What is a solid solution ? Give example.

2. Define isomorphous system.

3. State Fick's first law of diffusion.

4. Give the composition of low, medium and high carbon steel.

5. Define proof stress and ultimate tensile strength.

6. What is Hall-Petch equation and explain the terms involved in it ?

7. Calculate the critical current flow through a lead superconducting wire of 1 mm diameter. The critical field is 7.9×10^3 amp/metre.

8. Differentiate between dielectric materials and insulators.

9. What are composites ? Give an example for natural and manmade composites.

10. Give any four applications of shape memory alloys.

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PART – B

(5×16=80 Marks)

11. a) What is a peritectic phase diagram ? Draw a typical equilibrium diagram for a eutectic type of system with limited solid solubility and explain its important features.

(OR)

b) What is binary phase diagram ? Explain in detail about binary isomorphous system and the region present in it.

12. a) i) Compare pearlitic and martenstic transformation. (8)

ii) List the alloying of Si and Cr on properties and structure of steel. (8)

(OR)

b) i) Calculate the amounts and compositions of phases and microconstituents in a Fe-0.60%C alloy at 726°C. (10)

ii) What are the general properties of tool steels ? (6)

13. a) What is fracture ? Discuss the different types of fracture. (16)

(OR)

b) i) Discuss the strain hardening mechanism in detail. (8)

ii) What is solid solution strengthening ? Discuss in detail the various variables affecting it. (8)

14. a) Explain the hysteresis phenomenon in a ferromagnetic material using domain theory and draw the B-H curve for soft and hard magnetic materials. (16)

(OR)

b) Explain the phenomenon of super conductivity and the properties exhibited by superconductors. (16)

15. a) Classify the composites based on the matrix phase. Compare them based on their properties and applications. (16)

(OR)

b) What are nanomaterials ? Explain the properties and applications of Nanomaterials. (16)

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