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18ME34

Third Semester B.E. Degree Examination, July/August 2022
Material Science

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Calculate ADF of BCC crystal structure. (06 Marks)
b. Discuss briefly edge dislocation in crystals. (06 Marks)
c. State and explain Fick's laws of diffusion. Also explain factors affecting diffusion. (08 Marks)

OR

- 2 a. Explain with the help of stress-strain diagram stiffness, yield strength, ductility and toughness. (08 Marks)
b. Deduce the relation between true stress and engineering stress. (06 Marks)
c. A tensile load of 500N applied on a carbon steel rod of 10mm diameter, the diameter after elongation reduces to 9mm. Find true stress, engineering stress, true strain and engineering strain. (06 Marks)

Module-2

- 3 a. Discuss ductile and brittle fracture with clear differences. (06 Marks)
b. What is fatigue? Explain R.R. Moore fatigue testing method with S – N diagram. (07 Marks)
c. What is creep? Explain three stages of creep with neat graph also explain why 2nd stage is very important. (07 Marks)

OR

- 4 a. Explain Hume-Rothery rules for the formation of substitutional solid-solution. (06 Marks)
b. Draw the Iron-Carbon diagram and label all the phases, temperatures and invariant points on it. (07 Marks)
c. Derive the expression for critical radius in homogeneous nucleation. (07 Marks)

Module-3

- 5 a. Superimpose CCT diagram on TTT diagram and explain the importance of both the diagrams. (07 Marks)
b. Explain Annealing and Normalising with necessary figures. (06 Marks)
c. Discuss Martempering and Austempering processes with neat figures. (07 Marks)

OR

- 6 a. With the help of Aluminium – Copper phase diagram discuss age hardening process. (07 Marks)
b. Discuss Gray cast iron composition, properties and uses. (07 Marks)
c. Discuss Induction hardening and Flame hardening with neat diagrams. (06 Marks)

Module-4

- 7 a. What is composite? Classify the composites. (06 Marks)
b. State the advantages, disadvantages and applications of composites. (08 Marks)
c. Explain any one process of manufacturing composites. (06 Marks)

OR

- 8 a. Deduce the expression for iso-stress and iso-strain conditions of composites of Young's modulus. (08 Marks)
- b. Explain fulltrusion process with neat sketch. (06 Marks)
- c. Briefly explain metal matrix and ceramic matrix composites. (06 Marks)

Module-5

- 9 a. Explain properties and different types of ceramics. (06 Marks)
- b. With the help of neat sketch explain injection moulding process. (06 Marks)
- c. State the applications and advantages of ceramics and polymers. (08 Marks)

OR

- 10 a. What is shape memory alloy? Discuss the same. (07 Marks)
- b. Discuss the optical and thermal materials. (06 Marks)
- c. Discuss the fiber optics, piezo – electric and smart materials. (07 Marks)

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