

# CBCS SCHEME

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18MR32

## Third Semester B.E. Degree Examination, July/August 2021 Materials Science

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Define the following :
  - i) Atomic packing factor
  - ii) Unit cell
  - iii) Co-ordination number.(06 Marks)  
b. Classify crystal imperfection. Explain Edge dislocation with a neat sketch. (08 Marks)  
c. Determine atomic packing factor of FCC material. (06 Marks)
- 2 a. Explain stress-strain diagram of mild-steel with a neat sketch. (08 Marks)  
b. State and explain Fick's law of diffusion. (08 Marks)  
c. Define : i) Toughness ii) Resilience iii) Stiffness iv) Hardness. (04 Marks)
- 3 a. Explain slip and twinning with the help of neat sketch. (08 Marks)  
b. Explain the Griffith's theory for brittle fracture. (06 Marks)  
c. Sketch the basic modes of fracture and list the difference between them. (06 Marks)
- 4 a. What is meant by creep? With the help of creep curve explain different stages of creep. (08 Marks)  
b. Draw typical S-N curves for mild steel and aluminium, explain. (06 Marks)  
c. What is stress relaxation? Derive an expression for stress relaxation. (06 Marks)
- 5 a. Explain Hume Rothery rules for the formation of solid solution. (10 Marks)  
b. Explain with neat phase diagram, the eutectic and eutectoid reactions. (10 Marks)
- 6 a. State the Gibb's phase rule and explain with a simple example. (10 Marks)  
b. Explain homogeneous nucleation. Discuss the significance of critical radius of nuclei. (10 Marks)
- 7 a. Explain with neat sketch Fe-C equilibrium diagram and label all the fields. Explain the invariant reaction in the system. (10 Marks)  
b. Explain with a neat sketch TTT diagram and label all the fields for a eutectoid steel. (10 Marks)
- 8 a. Explain : i) Flame hardening ii) Annealing iii) Normalizing iv) Hardening. (12 Marks)  
b. Define Hardenability. Explain with neat sketches the Jominy End Quench Test. (08 Marks)
- 9 a. Write a note on :
  - i) Aluminium alloys
  - ii) Copper alloys.(08 Marks)  
b. Briefly explain the composition, properties and applications of :
  - i) Grey cast Iron
  - ii) SG Iron.(12 Marks)
- 10 a. Explain the following with neat sketch,
  - i) Spray lay-up process
  - ii) MMC's by stir casting.(10 Marks)  
b. Write short note on :
  - i) Filament winding
  - ii) Pultrusion process.(10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.