

# CBCS SCHEME

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18MR32

## Third Semester B.E. Degree Examination, Jan./Feb. 2021 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. Define Atomic packing factor. Derive an expression for atomic factor of FCC structure. (08 Marks)
- b. With the help of neat sketches explain line and surface imperfections in detail. (12 Marks)

OR

- 2 a. A steel rod of 10mm diameter and 1.5m length is subjected to an axial tensile load of 1KN. Determine: i) Stress ii) Strain iii) Elongation  
 $E = 205 \times 10^6 \text{KN/m}^2$ . (06 Marks)
- b. With a neat sketch explain stress strain diagram for mild steel. (06 Marks)
- c. Define the following:  
i) Toughness ii) Resilience iii) Secant modulus iv) Stiffness (08 Marks)

### Module-2

- 3 a. Differentiate between Slip and Twinning. (06 Marks)
- b. Define fracture. Explain the stages involved in ductile fracture. (08 Marks)
- c. Explain briefly the ductile to brittle transition behavior of ductile materials. (06 Marks)

OR

- 4 a. State and explain different fatigue protection methods. (08 Marks)
- b. Define creep. With a neat sketch explain the stages involved in creep. (12 Marks)

### Module-3

- 5 a. Define heterogeneous nucleation. How heterogeneous nucleation takes place in solidification of metals. (07 Marks)
- b. What are solid solutions? Explain the different types of solid solutions. (08 Marks)
- c. State and explain Gibb's phase rule. (05 Marks)

OR

- 6 a. Explain the following systems:  
i) Eutectoid system ii) Peritectoid system (08 Marks)
- b. Sketch and explain the construction of phase diagram. (12 Marks)

### Module-4

- 7 a. Draw Fe-C Diagram and label the parts. (10 Marks)
- b. With a neat sketch explain CCT curves. (10 Marks)

OR

- 8 a. Define heat treatment. Explain annealing process and its types. (08 Marks)
- b. Differentiate between austempering and martempering. (05 Marks)
- c. Sketch and explain induction hardening process. (07 Marks)

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.

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Module-5

- 9 a. Explain the properties composition and uses of grey cast iron (10 Marks)  
b. Explain the properties Composition and uses of Al alloys. (10 Marks)

OR

- 10 Write a note on the following:  
i) Applications of composites  
ii) Bag molding process  
iii) Powder metallurgy technique  
iv) Pultrusion process. (20 Marks)

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