

# CBCS Scheme

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15MT32

## Third Semester B.E. Degree Examination, Dec.2017/Jan.2018 Material Science and Technology

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- Draw the stress – strain diagram for mild steel specimen and define elastic limit, ultimate strength and fracture strength. (08 Marks)
  - State Fick's I and II law of diffusion and explain factors affecting diffusion. (08 Marks)

OR

- With the help neat sketches, explain sudden strain, transient creep and viscous creep of creep deformation. (08 Marks)
  - Explain stages of fatigue failure and type of fatigue loading with neat sketches. (08 Marks)

### Module-2

- With the neat sketches, explain procedures for construction of TTT diagram for 0.8%C eutectoid steel. (08 Marks)
  - With the help of TTT diagram superimposed with continuous cooling curves, explain the transformation of austenite into coarse pearlite, medium pearlite, full martensite and lower bainite. (08 Marks)

OR

- With neat sketches explain Austempering and Martempering. (08 Marks)
  - Explain the composition properties and applications of brasses, bronzes, Al – Zn alloy and SG Iron. (08 Marks)

### Module-3

- With neat sketch explain mechanism of solification and derive an equation for critical radius of nucleus  $r^*$  in homogeneous nucleation. (08 Marks)
  - With neat sketches explain three types of grain structures which can result in ingot castings. (08 Marks)

OR

- With the neat sketch explain the phase diagram for two metals completely soluble in the liquid state but partially soluble in solid state and explain solidification of 30% and 70% composition and eutectic composition alloy. (08 Marks)
  - Explain lever rule and calculate the amount of  $\alpha$  and  $\beta$  in the alloy of a binary alloy A – 50% B contains, at a particular temperature, two solid phases  $\alpha$  and  $\beta$ . The composition of  $\alpha$  and  $\beta$  are 5% B and 95% B. (08 Marks)

**Module-4**

- 7 a. Define composites and explain classification of composites materials. (08 Marks)  
b. Explain with figures hand layup process and spray up process for manufacturing composite materials. (08 Marks)

**OR**

- 8 a. Explain the different types of matrix materials and types of reinforcements. (08 Marks)  
b. Differentiate between thermoplastic polymers and thermosetting polymers. (08 Marks)

**Module-5**

- 9 a. Write a note on magnetostrictive materials and magnetorheological fluids. (08 Marks)  
b. What are shape memory alloys and explain properties and applications of it. (08 Marks)

**OR**

- 10 a. Define transducers and with neat sketch explain the principle of operation of LVDT. (08 Marks)  
b. With neat sketch explain the principle of operation of load cell and state types of load cells. (08 Marks)

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