CBCS SCHEME

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15ME/MA32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Material Science

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Draw FCC lattice and calculate its atomic packing factor. **(04 Marks)**

b. Classify crystal imperfection, explain points defect in detail. **(06 Marks)**

c. The surface of steel gear made of 1020 steel (0.2%C) is to be gas carburized at 927°C. calculate the time required to increase the carbon content to 0.4% at 1 mm below the surface if the carbon potential at surface is 1.2 wt%. erf(0.9) = 0.8 **(06 Marks)**

OR

2 a. Define creep, with a typical creep curve, explain three stages of creep. **(08 Marks)**

b. With the help of a neat conventional stress-strain diagram, explain behavior of mild steel, under tension till fracture. **(06 Marks)**

c. Draw S-N curve for steel. **(02 Marks)**

Module-2

3 a. Explain Hume Rathery rules for the formation of solid solution. **(06 Marks)**

b. Draw and explain the Iron-Carbon equilibrium diagram and label all the points and fields. **(10 Marks)**

OR

4 a. Explain the following with example:
i) Gibb's phase rule
ii) Lever rule **(10 Marks)**

b. Explain any four types of stainless steel based on their crystal structure. **(06 Marks)**

Module-3

5 a. What is TTT diagram? Explain with a neat diagram the martensitic transformation of austenite. **(08 Marks)**

b. Write notes on the following:
i) Annealing
ii) Carburizing **(08 Marks)**

OR

6 a. What is hardening? Explain with a neat sketch induction hardening. **(08 Marks)**

b. Briefly explain the composition, properties and applications of grey cast iron. **(08 Marks)**

Module-4

7 a. What are properties of ceramic materials? **(04 Marks)**

b. With a neat sketch, explain tape casting. **(06 Marks)**

c. Explain with a neat diagram, the processing of plastic by injection molding. **(06 Marks)**

OR

8 a. Explain working principle of optical fiber. **(06 Marks)**

b. What are the applications of shape memory alloys? **(06 Marks)**

c. Explain any two methods of NDT. **(04 Marks)**

Module-5

9 a. With a neat sketch, explain filaments winding. **(08 Marks)**

b. Explain production of composite materials by spray-up process. **(08 Marks)**

OR

10 a. A tensile load of 500 N is applied to a epoxy-glass fiber composite. If the cross section of the composite is 1 mm^2 and the volume of the fiber is 30% calculate the stess in the glass fiber when:

i) The load axis is parallel to the fiber

ii) The load axis is perpendicular to the fiber.

Take the values of Young's modulus for the glass fiber as 86 GN/m^2 and for matrix as 3.38 GN/m^2. **(06 Marks)**

b. *Explain the following:*

i) Production of MMC's by stir casting

ii) Pultrusion process. **(10 Marks)**

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