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Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018
Course Code: ME210
Course Name: METALLURGYAND MATERIALS ENGINEERING (MC)

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any three questions, each carries 10 marks.

Marks

1 a) List any five differences between Slip and Twinning. (5)

    b) Sketch the following planes and directions in a cubic crystal: (100), (110), (111), [$\bar{2}12$], [$10\bar{2}$] in a cubic unit cell. (5)

2 a) Explain Schmid's law and the term critical resolved shear stress. (4)

    b) Show that the atomic packing factor for BCC is 0.68. (3)

    c) The (1 1 1) plane of a cubic crystal is inclined at 26^0 to an X –ray beam. If the inter planar distance is 1.506 A^0, compute the wave length that will give first order reflection. What is the lattice constant for the crystal? (3)

3 a) The yield strength of mild steel with an average grain size of 0.05mm is 138 MPa. The yield strength of the same steel with a grain size of 0.007mm is 276 MPa. What will be the average grain size of the same steel with a yield stress of 207 MPa? Assume Hall-Petch equation is valid. (6)

    b) State and explain Fick's second law of diffusion. (4)

4 a) Explain the steps involved in the preparation of specimen for metallographic examination. (6)

    b) Mention at least four differences between SEM & TEM (4)

PART B
Answer any three questions, each carries 10 marks.

5 Draw the Iron-Carbon equilibrium diagram and explain the invariant reactions associated with steel. (10)

6 a) Mention any four differences between Normalising and Annealing. (4)

    b) Define solid solutions? State Hume-Rothery's rule for the formation of substitutional solid solution. (6)

7 Give composition, microstructure, properties and applications of different types of cast irons. (10)

8 a) Discuss the strengthening mechanisms for single phase materials. (6)

b) Differentiate between cold working and hot working. (2)

c) Explain the phenomenon of Bauschinger effect. (2)

PART C
Answer any four questions, each carries 10 marks.

9 a) Explain the mechanism of Fatigue with a suitable diagram mentioning its stages. (7)

  b) List any three factors affecting the Fatigue. (3)

10 a) Discuss the process of ductile to brittle transition and explain the significance of Ductile-Brittle Transition Temperature. (7)

  b) Illustrate the transgranular and intergranular modes of fracture. (3)

11 a) Define creep? Sketch a typical creep curve and explain different stages of creep (7)

  b) Define super plasticity. Give one application of super plasticity. (3)

12 List the classification of composites. Explain about any two types of composites. (10)

13 a) Define ceramics? Enumerate the types of ceramics? Mention any two advantages of ceramics. (6)

  b) Describe about nuclear materials. (4)

14 a) Write short note on (i) Biomaterials (ii) Smart materials. (6)

  b) Explain about super alloys. Mention any two important applications of super alloys. (4)

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