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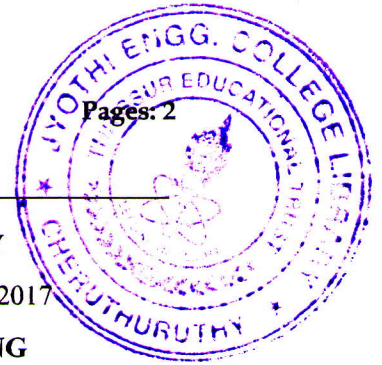
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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017

ME210: METALLURGY AND MATERIALS ENGINEERING

(MA, MP, ME, PE)

Max. Marks: 100   Duration: 3 Hours

PART A
(Answer any THREE questions)

1. a. Derive the expression for atomic packing factor for the FCC crystal structure.   (5)
    b. Describe the frank read source theory of dislocations.   (5)

2. a. Copper has an atomic radius of 0.128 nm, an FCC crystal structure, and anatomic weight of 63.5 g/mol. Compute its theoretical density.   (6)

    b. State and explain Fick's first law.   (4)

3. a. Compare edge dislocation and screw dislocation   (5)

    b. State and explain Fick's second law   (5)

4. Explain mechanisms of plastic deformation of metals by slip and twinning.   (10)

PART B
(Answer any THREE questions)

5. a) State the Hume Rothery rules for substitutional solid solution.   (4)

    b) Distinguish between the properties of pearlite and martensite.   (6)

6. With a neat sketch explain the iron-carbon equilibrium diagram and also give the equations for the binary reactions depicted in it.   (10)

7. a) What is hardenability? Explain the Jominy end quench test.   (5)

    b) Explain any two strengthening mechanisms.   (5)

8. a) Differentiate between the properties of Mo-type and W-type HSS   (4)

    b) List the major features of any three types of cast iron.   (6)

PART C
(Answer any FOUR questions)

9. a) Write short notes on stress concentration and stress raiser. (5)

    b) Explain the Griffith theory of fracture. (5)

10. a) Sketch and explain the S-N curves for ferrous and nonferrous metals (5)

    b) Explain the types of loading that causes fatigue failure. List the preventive measures taken for reducing the risk of fatigue failure (5)

11. a) Explain Ductile to Brittle Transition Temperature. List the factors affecting this phenomenon. (5)

    b) Define Fracture toughness. (5)

12. a) Sketch creep curve and explain different stages of creep. (5)

    b) What are the steps to be taken to prevent creep failure? (5)

13. a) Give two examples for ceramic materials. Explain the properties of ceramic materials? (5)

    b) Explain the classifications of Composite materials. (5)

14. Write short notes on:

    a) Smart materials (5)

    b) Bio Materials (5)

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