

Reg. No. \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

**ME210: METALLURGY AND MATERIALS ENGINEERING (MA, ME, MP, PE)**

Max. Marks: 100

Duration: 3 Hours

**PART A***(Answer any THREE questions)*

1. a) Describe the procedure to obtain Miller indices for crystal planes. (3)  
b) What are Bravais lattice systems? What is a unit cell? (7)
2. a) Obtain atomic packing factor for BCC structure. (5)  
b) Explain Schmid's law and the term critical resolved shear stress. (5)
3. Distinguish Edge and screw dislocations with a sketch of Burger's vector. (10)
4. a) Describe step by step procedure for metallographic specimen preparation? Name any two etchants. (5)  
b) Explain the procedure to study crystal structure using X-Ray diffraction (XRD) method. (5)

**PART B***(Answer any THREE questions)*

5. a) Define the terms solubility limit and solid solutions. (3)  
b) Explain the Hume-Rothery's Rules and its importance. (4)  
c) Draw the phase diagram of a pure substance with a suitable example and explain the triple point with its significance. (3)
6. What are strengthening mechanisms? Explain. (10)
7. a) Differentiate pure substance and alloy. (2)  
b) What is alloying? Why it is done? (4)  
c) Give 4 major alloying elements used in iron and their specific advantages and applications of the alloy. (4)
8. Classify Grey cast iron and explain their composition, microstructure and applications. (10)

**PART C**

*(Answer any FOUR questions)*

9. With a neat sketch explain the procedure for fatigue testing and draw the S-N curve.  
What is the significance of S-N curve? (10)
10. Brief upon the following
- a) Stress concentration. (2.5)
  - b) Residual stresses. (2.5)
  - c) Brittle fracture. (2.5)
  - d) Ductile to Brittle transition temperature. (2.5)
11. Draw the creep curve and explain the phenomenon occurring at each stages of creep.  
Give an application of creep phenomenon. (10)
12. Give atleast two applications of composites in aerospace industry. What properties make them suitable for the above applications? (10)
13. What are smart materials? Give atleast two examples and applications for them. (10)
14. Classify ceramics with practical applications for each. Give an example for each of the AX, AmXp, AmBmXp type structures in ceramics. (10)

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