

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: ME210**

**Course Name: METALLURGY AND MATERIALS ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any three questions, each carries 10 marks.*

Marks

- 1 a) Show in diagram the (1 1 1) planes of a cubic lattice. Calculate their interplanar distance. (5)
- b) Calculate the Bragg angle if (1 1 1) planes of a cube ( $a = 3.57 \text{ \AA}$ ) crystal are exposed to X rays ( $\lambda = 1.54 \text{ \AA}$ ) (5)
- 2 Write Notes on:
  - a) Slip (5)
  - b) Twinning (5)
- 3 a) Give the comparison between an edge dislocation and a screw dislocation. (5)
- b) State and explain Fick's second law (5)
- 4 a) Explain the common mechanisms of diffusion in solids (5)
- b) What are the main factors affecting diffusion process? (5)

**PART B**

*Answer any three questions, each carries 10 marks.*

- 5 a) What useful information does a phase diagram provide? (3)
- b) In a binary system of A and B, liquid phase of 40% A (6% B) is co-existing with solid phase of 80% A (20% B). For an overall composition of 45% A, Calculate the fraction of each phase in the given binary system. (4)
- c) What is the difference between hardening power and hardenability? (3)
- 6 a) State and explain Gibb's phase rule. (4)
- b) What is a solid solution? With suitable examples, explain the different types of solid solutions. (6)
- 7 a) Discuss the functions of alloying elements in steel. (8)
- b) Explain why stainless steels are corrosion resistant. (2)
- 8 Give the advantages, disadvantages and applications of the following:
  - a) Flame hardening (5)
  - b) Induction hardening (5)

**PART C**

*Answer any four questions, each carries 10 marks.*

- 9 a) Explain Griffith theory of fracture. (5)  
b) Explain the differences between ductile and brittle fractures. (5)
- 10 a) What is meant by fatigue? Describe the factors affecting fatigue. (6)  
b) Distinguish between transgranular and intergranular fracture. (4)
- 11 a) Write notes on DBTT. (5)  
b) With the help of a neat sketch explain fatigue test. (5)
- 12 Write notes on:  
a) Ceramic materials (5)  
b) Bio materials (5)
- 13 a) Draw a typical creep curve and explain the various stages involved in creep. (5)  
b) Write a note on Metal matrix composites. (5)
- 14 a) What are composites? Give the classification of composites. (5)  
b) Give the application of composites. (5)

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