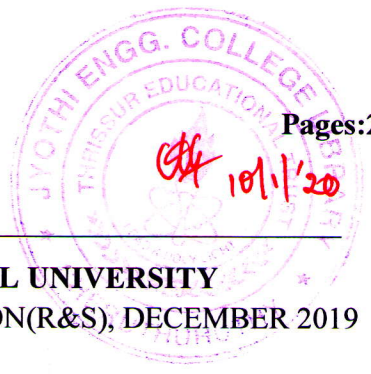E   C192062   Pages:2

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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   (5)
       distance.

   b) Calculate the Bragg angle if (1 1 1) planes of a cube (a = 3.57 Å) crystal are   (5)
       exposed to X rays ($\lambda = 1.54$ Å)

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   (4)
       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.

   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   (6)
       solid solutions.

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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