Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree Examination December 2021 (2019 scheme)

Course Code: MET205

Course Name: METALLURGY & MATERIAL SCIENCE

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1	Explain the good electrical and thermal conductivity of metals with respect to their atomic bonding?	3
2	How polymorphism differ from allotropy?	3
3	How high angle grain boundary differ from low angle grain boundary?	3
4	What is forest of dislocation?	3
5	Define Gibbs phase rule.	3
6	What are the stages involved in normalizing heat treatment process?	3
7	What is HSLA steel?	3
8	What is malleable iron?	3
9	What is deformation by creep?	3
10	How composite differ from metals, polymers and ceramics?	3

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

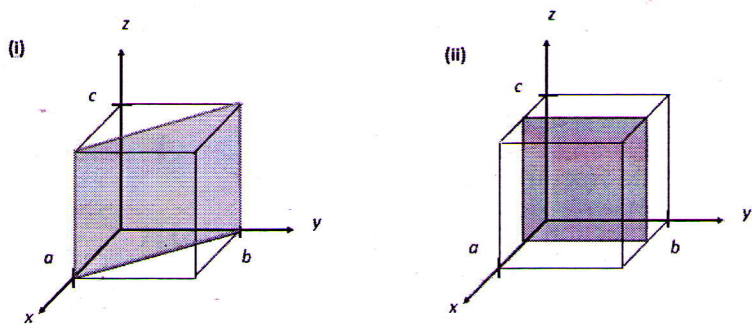
11 a.) Define co-ordination number and atomic packing factor. **(3mark)**

b) Estimate effective number of atoms, co-ordination number and atomic packing factor for an HCP. **(11 marks)** 14

OR

12 **a)** Explain the procedure to find Miller indices for a plane. **(4 marks)**

b) Find the miller indices for the following planes? **(8 marks)** 14



c) What are equivalent planes? **(2 marks)**

Module 2

13 Describe the following defects in crystalline materials (14)

a) Point defects **(4 marks)**

b) Dislocations or linear defects **(6 marks)**

c) Surface defects **(4 marks)**

OR

14 a) Derive expression for Fick's laws of diffusion. **(10 marks)** (14)

b) What are the applications of diffusion? **(4 marks)**

Module 3

15 a) With a neat sketch explain binary isomorphous phase diagram. **(6 marks)** (14)

b) How composition and relative phase fraction can be determined in the two-phase region in a binary isomorphous phase diagram? **(8 marks)**

OR

16 Describe the following (14)

a) Austempering **(5marks)**

b) Martempering **(5 marks)**

c) Ausforming **(4 marks)**

Module 4

17 a. Explain the phenomena of recovery, recrystallisaion and grain growth intimately associated with the annealing of a plastically deformed crystalline material. **(9 marks)** (14)

b. How Bauschinger effect help in metal forming of materials? **(5 marks)**

OR

18 a) How alloying effects the *Polymorphic transformation temperature and critical cooling rate of the steels?* **(8 marks)** (14)

b) Name any 6 alloying elements, their concentration and function when added to steels. **(6 marks)**

Module 5

19 a) Describe the mechanism and structural features of fatigue failure. **(8marks)** (14)

b) Discuss the property super-plasticity. What are its engineering applications? **(6 marks)**

OR

20 a) Explain Griffith theory of brittle fracture. **(10 marks)** (14)

b) List out various methods of protection against fracture. **(4 marks)**

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