

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: ME210

Course Name: METALLURGY AND MATERIALS ENGINEERING (MC)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three questions, each carries 10 marks.

- | | | Marks |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1 | a) Explain the steps for determining Miller indices for crystallographic planes. | (4) |
| | b) Describe Bravais lattice systems. Comment on the concept of a unit cell. | (6) |
| 2 | a) Differentiate between polymorphism and allotropy with examples. | (4) |
| | b) Copper (FCC) has density of 8.96gm/cc. Calculate the unit cell dimension and radius of copper atom. Given atomic mass of Copper 63.54 amu. | (4) |
| | c) Show that resolved shear stress reaches maximum value when $\lambda = \phi = 45^\circ$. | (2) |
| 3 | a) Illustrate Edge and Screw dislocation in reference with Burgers Vector. | (7) |
| | b) Describe Frank Read Source. | (3) |
| 4 | a) With suitable sketches explain point defects in a crystal structure. | (8) |
| | b) Determine the ASTM grain size number if 25 grains per square inch are measured at a magnification of 200. | (2) |

PART B

Answer any three questions, each carries 10 marks.

- | | | |
|---|----------------------------------------------------------------------------------------------------|------|
| 5 | a) Explain microstructure evolution of slowly cooled 0.6% C steel. | (6) |
| | b) List the four types of invariant reactions in general. | (4) |
| 6 | Enumerate the surface treatments done on steels? Explain any two processes. | (10) |
| 7 | Explain the process of recovery, recrystallisation and grain growth in a strain hardened material. | (10) |
| 8 | a) Describe about grey cast iron and nodular cast iron. | (4) |
| | b) Comment on high speed steels? Explain the effect of alloying elements in HSS. | (6) |

PART C

Answer any four questions, each carries 10 marks.

- | | | |
|----|--------------------------------------------------------------------------------------------------------------------|------|
| 9 | Distinguish between ductile fracture and brittle fracture. Explain the factors influencing the processes. | (10) |
| 10 | Draw and explain S-N curve for ferrous and non-ferrous metals. Explain various ways to improve fatigue resistance. | (10) |
| 11 | a) Differentiate between thermal fatigue and thermal shock. | (2) |
| | b) Define Fracture toughness. Mention the expression for stress intensity factor in | (3) |

connection with fracture toughness.

- c) Explain the appearance of typical fatigue fracture surface with a neat sketch. (5)
- 12 Discuss about the structural changes that occur during the process of creep. (10)
- 13 a) Comment on the desired characteristics for the matrix and fiber phase in preparation of fibrous composite. Enumerate the functions of matrix phase. (6)
- b) Explain about hybrid composite. (4)
- 14 Write short notes on a) Maraging steels b) Smart materials. c) intermetallics d) super alloys. (10)

