

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: ME210

Course Name: METALLURGY AND MATERIALS ENGINEERING (MA,ME,MP)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three full questions, each carries 10marks.

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|---|--|-------|
| 1 | a) Sketch within a cubic unit cell the following planes $(1\ 1\ \bar{1})$, $(1\ \bar{1}\ 0)$, $(0\ 0\ 1)$ and directions $[1\ 1\ 1]$, $[1\ 0\ 1]$ | (5) |
| | b) Calculate the radius of iridium atom, having FCC crystal structure, a density of 22.4 gm/cc and atomic weight of 192.2 gm/mol. | (5) |
| 2 | a) What is a slip system? Describe the slip systems in FCC, BCC and HCP metals | (6) |
| | b) What is the minimum cation to anion radius ratio for a coordination number of 8 is 0.732? | (4) |
| 3 | a) Differentiate between edge dislocation and screw dislocation with neat sketches | (6) |
| | b) Explain vacancy diffusion and interstitial diffusion with neat sketches. | (4) |
| 4 | a) Describe working of SEM with a neat sketch. | (8) |
| | b) Define grain size number. | (2) |

PART B

Answer any three full questions, each carries 10marks.

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|---|--|------|
| 5 | Describe the changes in microstructure with suitable sketch, when cooled slowly from austenite to room temperature for
i) Hypo eutectoid plain carbon steels ii) Eutectoid plain carbon steels iii) Hyper eutectoid plain carbon steels | (10) |
| 6 | What is hardenability? Describe hardenability test. What are the factors affecting hardenability? | (10) |
| 7 | Give the microstructure, composition, properties and applications of i) Gray Cast Iron ii) Malleable cast iron. | (10) |
| 8 | Explain the stages of age hardening of aluminium alloys. | (10) |

PART C

Answer any four full questions, each carries 10marks.

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| 9 | a) Distinguish between ductile and brittle fracture. | (4) |
| | b) What is ductile to brittle transition in steel DBTT? What are the factors affecting ductile to brittle transition? | (6) |
| 10 | Explain the process of crack initiation and crack propagation in fatigue. | (10) |
| 11 | a) Explain how fatigue limit of a ferrous material is determined. | (6) |
| | b) Explain notch sensitivity index in fatigue. | (4) |
| 12 | Write short note on
i) Shape memory alloys ii) Super alloys. | (10) |
| 13 | a) Define creep. Explain different stages of creep. | (6) |
| | b) What is superplasticity? | (4) |
| 14 | a) List two applications of composites. Differentiate between particle reinforced and fibre reinforced composites | (6) |
| | b) What is composite biomaterial? Give example. | (4) |
