

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree (S,FE) Examination December 2020 (2015 Scheme)

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

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|---|----|---|-----|
| 1 | a) | Why FCC is more ductile compared to BCC? | (5) |
| | b) | Compare slip and twinning. | (5) |
| 2 | a) | Explain Schmid's law. Derive an expression for Critical Resolved Shear Stress (CRSS)? | (5) |
| | b) | Discuss the effect of slip systems on the plastic deformation of metals. | (5) |
| 3 | a) | Differentiate homogenous and heterogenous crystallization. | (5) |
| | b) | Explain the effect of grain size and grain shape on dislocation movement. | (5) |
| 4 | a) | With the help of a neat sketch explain edge and screw dislocations. | (5) |
| | b) | Explain Fick's first and second laws of diffusion. | (5) |

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

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| 5 | With the help of a neat sketch explain Fe-C equilibrium diagram. | (10) |
| 6 | Explain the following heat treatments
i) Annealing ii) Tempering iii) Normalising iv) Spheroidizing v) Hardening | (10) |
| 7 | Explain the different types of strengthening mechanisms in materials. | (10) |
| 8 | Discuss the effect of following alloying elements on the properties of steel,
i) Molybdenum ii) Nickel iii) Chromium iv) Vanadium v) Tungsten. | (10) |

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

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| 9 | a) | Define fatigue and specify the conditions under which it occurs. | (5) |
| | b) | Explain why the strengths of brittle materials are much lower than predicted by theoretical calculations. | (5) |
| 10 | | Illustrate the mechanisms of creep. | (10) |
| 11 | | With the help of a neat diagram explain fatigue test. | (10) |
| 12 | | Explain the structural changes occurring due to creep. | (10) |

- 13 Explain the following i) Intermetallics ii) Maraging steel iii) Super alloys (10)
iv) Titanium v) Smart materials.
- 14 a) Explain Griffith theory of fracture. (5)
b) Explain bio materials. List any four applications. (5)
