

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<br>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,<br>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)

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