USN | | | | | | | | | | |

10ME/AU42A/10MEA/AUA402

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019

Material Science and Metallurgy

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define atomic packing factor. Find the atomic packing factor of BCC and FCC structures. **(07 Marks)**

b. Explain with sketches line and surface defects. **(08 Marks)**

c. State Fick's laws of diffusion. Explain briefly, factors affecting diffusion. **(05 Marks)**

2 a. Differentiate between ductile and brittle materials. **(06 Marks)**

b. Explain with sketches:
i) Offset yield strength
ii) Ultimate tensile strength
iii) Toughness **(06 Marks)**

c. Derive the expression for critical resolved shear stress for slip. **(08 Marks)**

3 a. Explain cup and cone fracture with neat sketch. **(08 Marks)**

b. Explain creep curve showing different stages. **(06 Marks)**

c. Define fatigue sketch the different types of fatigue loading. **(06 Marks)**

4 a. Explain with neat sketch mechanism of solidification. **(06 Marks)**

b. What is homogeneous nucleation? Derive the expression for total free energy change with a neat sketch. **(08 Marks)**

c. Define solid solution. Explain with sketch interstitial and substitutional solid solution. **(06 Marks)**

PART – B

5 a. Explain briefly the construction of phase diagram using cooling curve with sketches. **(10 Marks)**

b. Draw Iron carbon diagram label all phases. Give the three invariant reactions. **(10 Marks)**

6 a. Draw TTT diagram for Hypo-Eulectoid steel containing 0.5% carbon. Show different phases. **(11 Marks)**

b. Explain with sketch: (i) Normalizing (ii) Martempering (iii) Austempering. **(09 Marks)**

7 a. Compare Grey cast iron, spheroidal graphite iron with respect to composition, microstructure and properties. **(08 Marks)**

b. Explain in detail about: (i) Brasses (ii) Al-Si alloys (iii) Al- Cu alloy. **(12 Marks)**

8 a. Define composite materials. Explain the different composite material with examples. **(08 Marks)**

b. Explain with sketch, pultrusion process. **(06 Marks)**

c. Give the advantages and application of composite materials. **(06 Marks)**

* * * * *