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**MANIPAL INSTITUTE OF TECHNOLOGY**
Manipal University, Manipal – 576 104

**III SEM. B.Tech. MECHATONICS ENGG. DEGREE END SEMESTER MAKE UP EXAMINATION DEC 2015/JAN 2016**

**SUBJECT: MATERIALS SCIENCE AND ENGINEERING (MTE 2101)**

Time: 3 Hours MAX. MARKS: 50

**Instructions to Candidates:**

- Answer **ALL** the questions.
- Missing data, if any, may be assumed suitably.
- Draw neat labeled diagram wherever necessary.

**1A.** Two metal A and B have 100% mutual solubility in the liquid and solid states. The melting point of pure metals A and B are 900°C and 750°C. Details of the start of solidification and end of solidification of various alloys in the series are as follows: **(05)**

| Alloy of Composition | Temp. at start of solidification (°C) | Temp. at the end of solidification (°C) |
|---|---|---|
| 90% A – 10% B | 890 | 840 |
| 70% A – 30% B | 875 | 825 |
| 50% A – 50% B | 860 | 810 |
| 30% A – 70% B | 845 | 795 |
| 10% A – 90% B | 830 | 780 |

i. Draw the phase diagrams of the series if there are no solid state reactions and label all regions.
ii. Predict the number, type, relative amounts and concentration of phases present in an alloy of 60%A and 40%B at 830°C and 20°C.

**1B.** Describe the addition and condensation polymerization reaction. Also, explain the termination process of both the reactions. **(03)**

**1C.** Discuss the stress-strain behavior for a fiber reinforced composite when the load is applied in longitudinal direction with respect to the fiber alignment. **(02)**

**2A.** Draw the Iron-Iron Carbide Equilibrium diagram and explain the reaction which takes place at 1148°C. **(05)**

**2B.** State Luminescence. Describe it in the context of LED and LASERS. **(05)**

**3A.** Draw the FCC structure and show the packing structure of FCC is 0.74. **(03)**

**3B.** Discuss the following with appropriate sketch: i. Annealing. ii. Flame Hardening. **(04)**

**3C.** Discuss the following: i. Frenkel Defect. ii. Schottky Defect. **(03)**

**4A.** Discuss the following: i. Medium Carbon Steel. ii.Gray Cast Iron. **(02)**

**4B.** Describe the dispersion strengthened composites and its influencing factors. **(03)**

**4C.** What are Miller Indices? Represent the following Miller Indices in a simple unit cubic cell: **(05)**

i. [123]

ii. (121)

iii. [222]

iv. (201)

**5A.** Draw and explain the TTT diagram for eutectoid steel and mark the phases. **(05)**

**5B.** Discuss the process of Chemical Vapour Deposition and Sputtering with appropriate diagram. **(05)**