Code No: 53018 **R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech II Year I Semester Examinations, March - 2017**
**METALLURGY AND MATERIAL SCIENCE**
**(Common to ME, MCT, AME)**

**Time: 3 hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**
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1.a) Differentiate between ionic, covalent and metallic bonding with examples.
b) What is crystallization? Explain the cooling behavior of a metal while cooling from liquid to solid. [7+8]

2.a) Explain the governing rules for the formation of substitutional solid solutions.
b) Differentiate between intermetallic compounds and intermediate alloy phases. [7+8]

3. What are the different methods of construction of phase diagrams? And explain any one method in detail. [15]

4.a) What are tool steels? Explain their classification.
b) What would be the influence of each of the following alloying elements on the properties of a tool steel? chromium, tungsten, molybdenum, vanadium, silicon, manganese and cobalt. [7+8]

5.a) Explain the mechanism of heat removal during quenching.
b) Explain the importance of austenitizing temperature and homogeneity of austenite. [7+8]

6.a) Explain important properties of titanium.
b) Explain why the two-phase titanium alloys are stronger than the single phase alpha alloys.
c) Give at least two applications for alpha alloys, alpha-beta alloys and beta alloys of titanium. [5+5+5]

7.a) Explain the desirable characteristics of glasses.
b) What is the distinction between glass transition temperature and melting temperature?
c) The modulus of elasticity for titanium carbide (TiC) having 5vol % porosity is 30GPa. Compute the modulus of elasticity for the non-porous material. [5+5+5]

8.a) Name the three main divisions of composite material, and explain the distinguishing features of each.
b) What is a hybrid composite? List the important advantages of hybrid composites over normal fiber composites. [7+8]

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7.a) Explain in detail the mechanism of electric discharge grinding and state its advantages and limitations over EDM Process.

b) Explain in detail the effect of process parameters on surface roughness in EDM process. [5+5]

8.a) Explain with the help of neat sketch the working principle of a typical pulsed ruby laser machining system.

b) With the help of schematic diagram explain the laser beam machining process and explain the critical parameters and limitations of laser beam machining process. [5+5]

**OR**

9.a) Enumerate the advantages, limitations and applications of electron beam machining process.

b) Distinguish between electron beam machining and laser beam machining. [5+5]

10.a) Derive equation for metal removal rate in Chemical machining.

b) Classify different types of etchants used chemical machining process. Write its characteristics. [5+5]

**OR**

11.a) Write a short note on the recent developments in Plasma machining process.

b) Explain in detail the various process parameters which affect the material removal rate in in chemical machining process. [5+5]

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