B.E. Mechanical Engineering Third Semester (OLD) (CBS)

# ME305 - Engineering Metallurgy

P. Pages : 2 **GUG/W/18/1517**

Time : Three Hours * 1 1 9 6 * Max. Marks : 80

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Notes : 1. All questions carry marks as indicated.
2. Answer 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.

**1.** a) With suitable chart, differentiate between metals & non-metals. Give examples. **8**

b) What do you understand by polymorphism and Allotropy. Explain the terms with suitable example. **8**

**OR**

**2.** a) Explain the term 'Hardness'. How & why it is useful in mechanical engineering applications ? **8**

b) Differentiate between 'Microscopic Examination' & 'Macroscopic Examination' ? **8**

**3.** a) What do you understand by 'solid solution' ? What are their types ? Explain with neat diagram. **8**

b) Draw a neat diagram of 'Ingot structure' ? Explain the reason for different grain size at different locations. **8**

**OR**

**4.** a) Explain the Hume-Rothery rules for the formation of substitutional solid solution. **8**

b) What are the effects of grain size & grain shape on the properties of metal. **8**

**5.** a) Draw a neat Fe-$Fe_3C$ equilibrium diagram. Name all phases give all the details of diagram. **8**

b) Write three invariant reactions that occur in Fe-$Fe_3C$ equilibrium diagram. Mention carbon percent and temperature at appropriate places. **8**

**OR**

**6.** a) Differentiate between Annealing & normalizing. Draw the diagram of grain size that occur after these heat treatment processes. **8**

b) Explain Jominy End Quench hardenability test with suitable diagram. **8**

**7.** a) With the help of lever rule find out the proportion of Pearlite & cementite in slowly cooled (annealed) plain carbon steel containing 2.0% carbon. **8**

b) Draw microstructure of slowly cooled plain carbon steel with following carbon percent - **8**
i) Steel with 0% to 0.008% carbon
ii) Steel with 0.4% carbon
Name the phases present in steel.

**OR**

**8.** a) Write elaborately, the property requirements of tool materials. **8**

b) Write introduction, composition, heat treatment & uses of managing steel. **8**

**9.** a) Give brief account of Gray cast iron under the title of composition, production route, microstructure, properties & application. **8**

b) What do you understand by Ni-Hard cast iron ? What are the uses ? **8**

**OR**

**10.** a) Give classification of brass. Mention the percentage of copper & zinc. **8**

b) What is meant by season cracking of brass ? How it can be avoided ? **8**

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