

**ANURAG Engineering College**

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, Jan/Feb-2024

**METALLURGY AND MATERIAL SCIENCE****(MECHANICAL ENGINEERING)****Time: 3 Hours****Max.Marks:75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

	<b>Course Outcome</b>	<b>B.T Level</b>	<b>Marks</b>
1. Define Packing factor and grain boundary.	CO1	L1	2M
2. How Grain boundaries influence the ductility of materials.	CO1	L2	3M
3. What is meant by phase diagram? Give some examples.	CO2	L1	2M
4. Distinguish between interstitial solution and substitutional solution.	CO2	L1	3M
5. Give the various forms of steel as seen in Fe-C diagram.	CO3	L1	2M
6. What is the difference between annealing and normalizing?	CO3	L2	3M
7. How is steel different than Cast iron?	CO4	L2	2M
8. What are the alloys of copper? Give the properties of copper.	CO4	L1	3M
9. What are the constituents of ceramic material?	CO5	L1	2M
10. Differentiate between a metal and composite?	CO5	L2	3M

**Section B (Essay Questions)****Answer all questions, each question carries equal marks.****(5 x 10M = 50M)**

11. A) i) Calculate atomic packing factors for following structures: a) Body centred cubic structure. b) Face centred cubic structure.	CO1	L3	5M
ii) What is the role of grain size on the properties of a material?			5M
<b>OR</b>			
B) i) Discuss Hume-Rothery rules.	CO1	L3	5M
ii) Define crystallization of metal. Explain briefly about crystal dislocation.			5M
12. A) Describe clearly the construction of phase diagrams using cooling curves.	CO2	L3	10M
<b>OR</b>			
B) In a Lead Tin (Pb-Sn) system the following invariant reaction was observed at a temperature of 183 °C. Melting points of Lead and Tin are 327 °C and 232 °C.	CO2	L3	10M
i) Draw the phase diagram.			
ii) Calculate the fraction of total $\alpha$ in the alloy containing 80% Sn at 182 °C.			
13. A) Draw Iron-Iron carbide equilibrium diagram and label temperatures, composition and phases.	CO3	L3	10M
<b>OR</b>			
B) Explain briefly about the four heat treatment processes applicable to steels.	CO3	L3	10M
14. A) Write about different types of cast iron and explain their properties?	CO4	L3	10M
<b>OR</b>			
B) Explain the structure and properties of aluminum alloys.	CO4	L3	10M

15. A) Enumerate the classification, properties and applications of Composite materials. CO5 L3 10M

**OR**

B) Explain the classification, properties and applications of polymers. CO5 L3 10M