

### 1. Group - A (Short Answer Questions)

S. No.	Question	Blooms Taxonomy Level	Course Outcomes
<b>Unit – I</b>			
1	(a) What is a metallic bond? How does the type of bonding influences the properties of crystals? Distinguish between a family of planes and family of directions.. (b) Prove that FCC is closely packed than BCC by calculating atomic packing factor for both.	Application, Synthesis	1
2	(a) Explain Gibbs phase rule and its importance. (b) Explain the process of solidification of metals to form polycrystalline structure. What are the parameters which control the grain size on solidification?	Application	1
3	(a) Describe Ionic bond, Covalent bond, Metallic bond (b) Discuss how the properties strength, ductility, and electrical Conductivity are affected by these bondings.	Application	1
4	(a) Draw the unit cells of BCC, FCC, HCP crystal structures. b) Discuss number of atoms, co-ordination number, and atomic packing factor for each unit cell.	Comprehension, Application	1

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5	(a) Describe solidification process for pure metal in terms of nucleation and grain growth of metals. (b) Explain MILLER INDICES and its importance.	Application	1
6	a) What is the ASTM grain size number of a material. What is the influence of grain size on mechanical properties. b) Discuss X-ray diffraction in crystallography.	Comprehension, Application	1
7	a) Discuss the Hume –Rothery rules for the solid solubility of one element in another.. b) Explain the method of plotting an equilibrium diagram and derive the lever rule as applied to equilibrium diagram.	Comprehension, Application	1
8	(a) Explain methods to determine grain size (b) What is the mechanism for formation of grain boundary	Comprehension, Application	1
9	a) What is packing efficiency. How will you calculate density. b) How is the cored structure formed. How it can be eliminated.	Application, Synthesis	1
10	a) Differentiate substitutional and interstitial solid solutions with examples. b) What are intermediate phases.	Comprehension, Application	1
<b>UNIT – II</b>			
1	(a) Explain the importance of equilibrium diagrams in the development of new alloys (b) Draw Cu-Ni phase diagram and indicate the phases, temperatures and compositions.	Comprehension, Evaluation	3
2	(a) Define peritectic, eutectoid and eutectic reactions. b) How is the cored structure formed. How it can be eliminated	Evaluation, Application	3
3	a) Explain with sketch isomorphous system and discuss the equilibrium cooling of any one alloy from the above diagram. (b) Draw equilibrium diagram for eutectic type of system and discuss its important features.	Evaluation, Application	3
4	(a) Define eutectic and peritectic reactions (b) Define eutectoid and peritectoid reactions	Application	3
5	(a) Discuss Lever rule and explain its importance using eutectic system. (b) Discuss phase rule and its importance.	Analysis, Application	3
6	(a) Explain intermetallic compounds (b) Discuss interstitial compounds	Evaluation, Application	3
7	(a) What are intermetallic compounds (b) Discuss binary alloy phase diagram	Application, Evaluation	3
8	(a) What is equilibrium cooling (b) Discuss non-equilibrium cooling	Application	3
9	(a) Explain cooling of Bi- Cd eutectic type I system (b) Discuss cooling of Pb-Sn eutectic type II system.	Application	3
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<b>UNIT – III</b>			
1	(a) Name the allotropic forms of iron and explain lattice structure of each (b) Define alpha ferrite, austenite, cementite, delta ferrite	Application, Comprehension	3, 4
2	(a) Draw the iron-iron carbide equilibrium diagram and label all the regions. (b) Explain the phase reactions in iron-iron carbide phase diagram	Knowledge, Comprehension	3, 4

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3	a) Describe structural changes that take place when plain carbon steels:0.8 %C,0.4%C,1.2%C are cooled from austenite region to room temperature b) What is the eutectic in iron –iron carbide system	Analysis, Comprehension	3, 4
4	a) Explain effect of small quantities of S,P,Mn,Si upon properties of steel b) Distinguish between hypo eutectoid and hyper eutectoid steels	Comprehension	3, 4
5	(a)Explain method of plotting isothermal transformation or TTT diagram (b)Draw TTT diagram for an eutectoid steel and indicate transformation products.	Synthesis	3, 4
6	(a) Explain annealing heat treatment (b) Discuss Normalizing heat treatment	Comprehension, Synthesis	3, 4 -9
7	a) What is hardening heat treatment b) Recommend a heat treatment process to improve the machinability of high carbon steel. Explain the process and indicate the micro structures desired.	Knowledge	3, 4
8	(a)What is tempering process and explain micro structures developed during Various tempering stages. (b) Describe aus tempering process	Knowledge, Comprehension	3, 4
9	a) Describe mar tempering process b) What is hardenability.Explain Jominy end quench test used for determining the hardenability of steels	Synthesis, Comprehension	3, 4
10	a) Discuss types of stainless steels and applications b) Explain tool steels,maraging steels,HSLA steels with applications	Comprehension	3, 4
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<b>UNIT – IV</b>			
1	(a) What are cast irons (b) Define white cast iron and explain its uses	Comprehension , knowledge	3
2	(a) Define grey cast iron and its uses (b) Define malleable cast iron and its uses.	Synthesis, Comprehension	3
3	(a) What is nodular cast iron.Explain its uses (b) What factors control the structure of cast iron	Comprehension, Analysis	3
4	(a) Explain Ni-resist cast iron (b) Discuss Ni-hard cast iron	Analysis, Knowledge	3
5	a) Explain importance of copper for engineering applications b) Discuss various types of brasses and their applications	Analysis Synthesis	3
6	a) Discuss heat treatable and non-heat treatable aluminium alloys (b) Discuss duraluminium and its applications	Analysis, Application	3
7	(a)Draw aluminium—copper phase diagram.Explain precipitation hardening.	Comprehension	3
8	(a)Discuss tin bronzes and important applications (b)What is alclad. Explain its advantages	Analysis, Application	3
9	a) Explain alpha titanium alloys and their uses. (b)Discuss importance of titanium alloys for strategic applications.	Synthesis, Application	3
10	(a)Explain alpha-beta titanium alloys and their uses (b)What are beta titanium alloys	Comprehension	3
<b>UNIT – V</b>			
1	(a) Define a ceramic material (b) Explain physical and mechanical properties of alumina ceramics	Application	1

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2	(a) Classify ceramic materials with examples (b) Explain Zirconia ceramics and their properties	Comprehension, Knowledge	1
3	(a) What are carbides (b) Explain manufacture of tungsten carbide tool bits	Comprehension	1
4	(a) Explain various nitrides (b) Discuss properties and applications of silicon nitride ceramics	Application	1
5	a) What are glass ceramics b) Explain applications various types of glasses	Comprehension, Knowledge	1
6	a) Discuss the importance of cermets in engineering b) What is sialon?	Synthesis, Knowledge	1
7	a) Discuss types of composites? b) What are the types of fibres used in composites?	Analysis, Comprehension	1
8	a) Explain manufacture of Fibre reinforced plastic? b) Bring out the typical applications of FRP?	Knowledge, Comprehension	1
9	a) Explain carbon-carbon composites? b) Discuss applications of c-c composites?	Comprehension, Knowledge	1
10	a) Discuss classification of polymers? b) Write briefly about thermo plastics and thermosetting plastics?	Knowledge, Comprehension	1