Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third semester B.Tech degree examinations (S) September 2020

Course Code: ME210
Course Name: METALLURGY AND MATERIALS ENGINEERING

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any three questions, each carries 10 marks.

			Marks
1	a)	Sketch within a cubic unit cell the following planes $(1\ \bar{1}\ 1)$, $(1\ \bar{2}\ 1)$, $(0\ 0\ 1)$ and directions $[1\ 1\ 1]$, $[1\ 1\ 0]$	(5)
	b)	An atom having FCC crystal structure has a density of 22.4 gm/cc and atomic weight of 192.2 gm/mol. Calculate its atomic radius.	(5)
2	a)	Explain the mechanism of crystallization in pure metals. What factors favour fine grain size?	(6)
	b)	Distinguish between a unit cell and a grain.	(4)
3	a)	Differentiate between edge dislocation and screw dislocation.	(5)
	b)	Explain any two diffusion mechanism with neat sketches.	(5)
4	a)	Define grain size number.	(2)
	b)	Describe the procedure for metallographic specimen preparation? Name any two etchants.	(8)

PART B
Answer any three questions, each carries 10 marks.

5	a)	Justify the need of Heat treatment processes for metals. Explain with neat sketch TTT diagram for heat treatment of steel.	(8)
	b)	What is critical cooling rate?	(2)
6	a)	Draw the iron carbon equilibrium diagram, label it and show the invariant points.	(7)
	b)	Write the reactions occurring at the invariant points indicating the temperature and composition of each phase.	(3)
7		Give the microstructure, composition, properties and applications of the following:	
	a)	Nodular Cast Iron	(5)
	b)	Grey cast iron.	(5)

8	a)	Give the factors affecting recrystallisation.	(5)
	b)	Differentiate hot working and cold working.	(5)

PART C
Answer any four questions, each carries 10 marks.

9	a)	What is fatigue? Explain the different stages involved in fatigue failure.	(6)
	b)	Describe how the fatigue life of a machine element can be improved.	(4)
10	a)	Explain Ductile to Brittle Transition Temperature. List the factors affecting this phenomenon.	(5)
	b)	Define Fracture toughness.	(5)
11		What do you mean by ductile fracture? With the help of neat sketches, explain the various stages of ductile fracture.	(10)
12	a)	Write notes on smart materials. Give the advantages and applications of smart materials.	(6)
	b)	Write notes on (i) piezo electric materials (ii) shape memory alloys.	(4)
13	a)	Define creep and briefly explain the factors affecting creep.	(5)
	b)	Write notes on: (i) Superplasticity (ii) creep resistant materials	(5)
14	a)	With the help of a neat sketch explain creep test.	(5)
	b)	Give the functions of matrix phase in composites.	(5)

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