


Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Programme Name : B. Tech-Mechanical	Semester : III
Course Name : Materials Engineering	Time : 03 hrs.
Course Code : MEMA2003	Max. Marks : 100
Nos. of page(s) : 2	

Instructions: Attempt all questions. One question from section B and C have an internal Choice.
Assume any missing data if required.

SECTION A

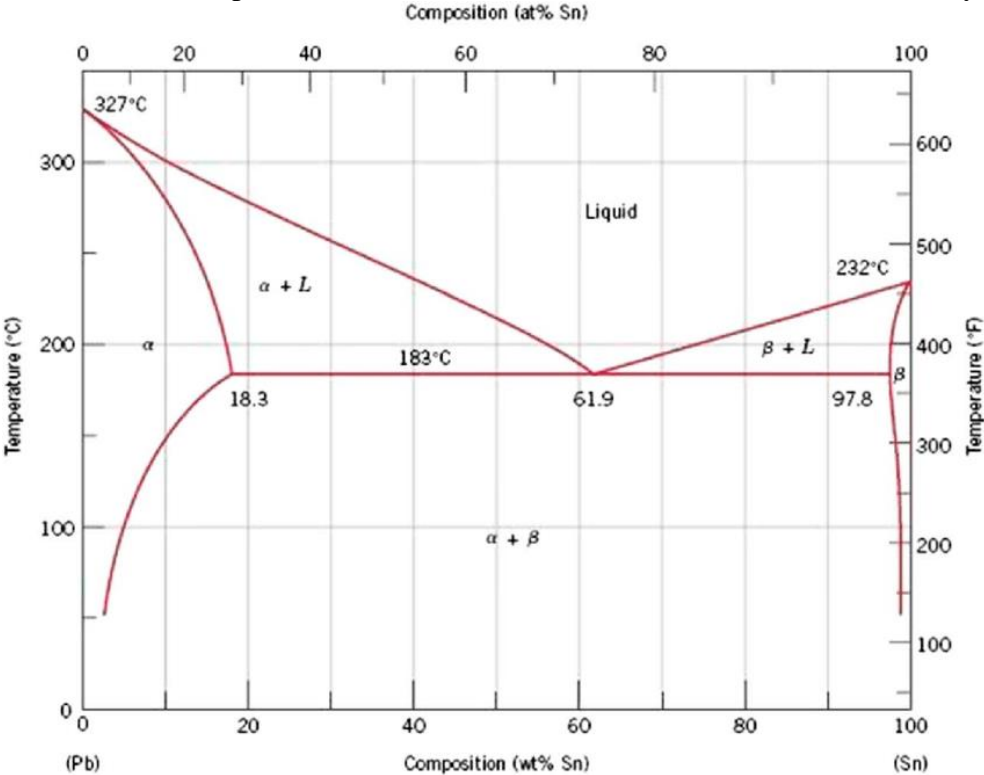
S. No.		Marks	CO
Q1	(a) Draw neat sketch of S-N curve for mild steel. (b) Define Vickers Hardness.	4	CO1
Q2	Sate Hume Rothery,s rules and discuss in detail	4	CO1
Q3	Draw the scheme of a eutectoid phase diagram of two component system.	4	CO2
Q4	Differentiate brittle and ductile fracture with appropriate examples.	4	CO3
Q5	Classify the different steels.	4	CO4

SECTION B

Q6	(a) Define homogeneous and heterogeneous nucleation.	3	CO1
	(b) Write the coordination number for BCC, FCC, and HCP unit cell.	3	
	(c) Define heat treatment process and mentioned its purposes.	4	
Q7	(a) Summarize the main objectives of Non-destructive testing.	4	CO2
	(b) Explain liquid penetrant testing with a suitable schematic diagram.	6	
Q8	(a) Build an isomorphous phase diagram for a Cu-Ni alloy and label all the points and its important features.	6	CO3
	(b) Identify the difference between austenite, ferrite, cementite, and pearlite.	4	
Q9	A		CO2
	(i) Define fatigue failure. Neatly sketch the various fatigue loading cycles.	5	
	(ii) Define Low cycle fatigue and explain the method to estimate the fatigue damage in metals.	5	
	Or		
	B		
	(i) Explain Griffith theory of brittle fracture.	5	
	(ii) Explain with neat sketches the two modes of fracture failure of metal.	5	

SECTION-C

Q10	(a) Classify heat treatment process	6	CO3
	(b) Describe full annealing, Recrystallization Annealing, Stress Relief Annealing, and Spheroidization Annealing.	8	

	(c) Discuss cyaniding and nitriding processes.	6	
<p>Q11</p>	<p>A. Analyze the Pb-Sn Phase diagram and answer the following questions:</p> <p>(i) Write the solubility limit and temperature of eutectic composition.</p> <p>(ii) Write the invariant reaction with phase composition.</p> <p>(iii) Sketch and explain the microstructure evolution of 60% Pb-40% Sn alloy.</p>  <p>B. Develop the microstructure evaluation of Pb-Sn alloy at eutectic composition with its phase composition and relative amount of phase present.</p> <p style="text-align: center;">Or</p> <p>B.</p> <p>(a) Classify different steels and write a short note on any two of them.</p> <p>(b) Write a note on ductile cast iron and malleable cast iron.</p>	<p>2</p> <p>2</p> <p>10</p> <p>6</p> <p>10</p>	<p>CO4</p>