Name:

Enrolment No:

End Semester Examination, May 2023

Course: Aircraft materials and manufacturing technology **Semester: IV**

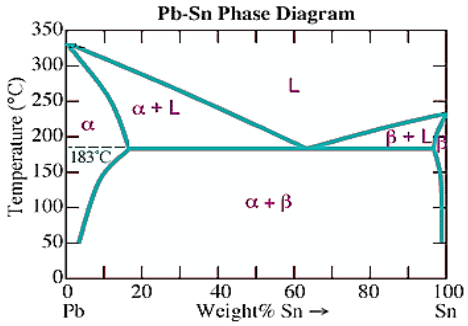
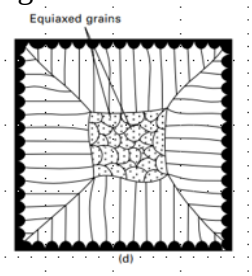
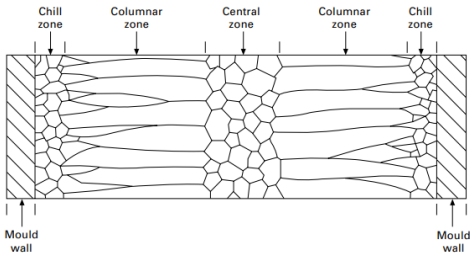
Program: B. Tech ASE **Time : 03 hrs.**

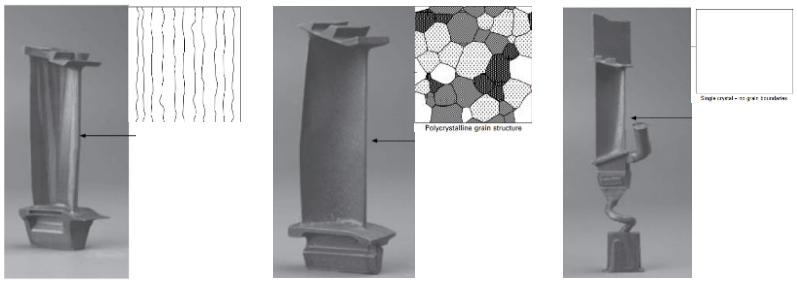
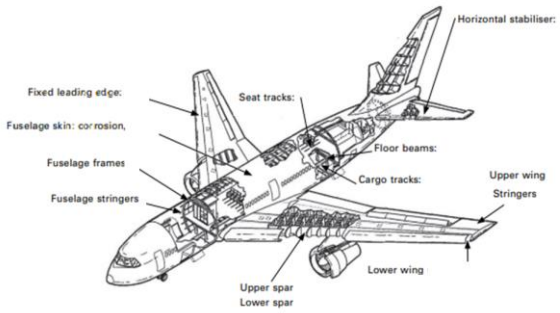
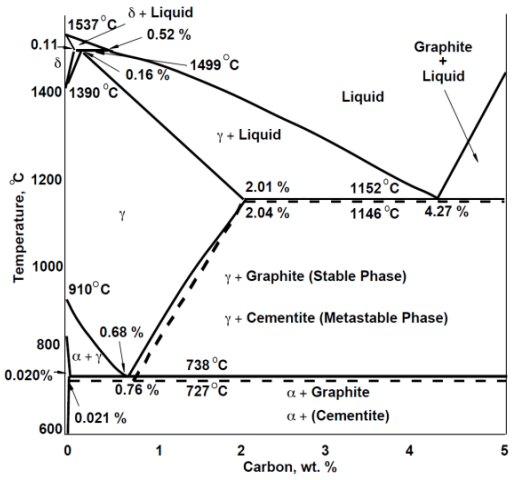
Course Code: ASEG2008 **Max. Marks: 100**

No. of pages: 3

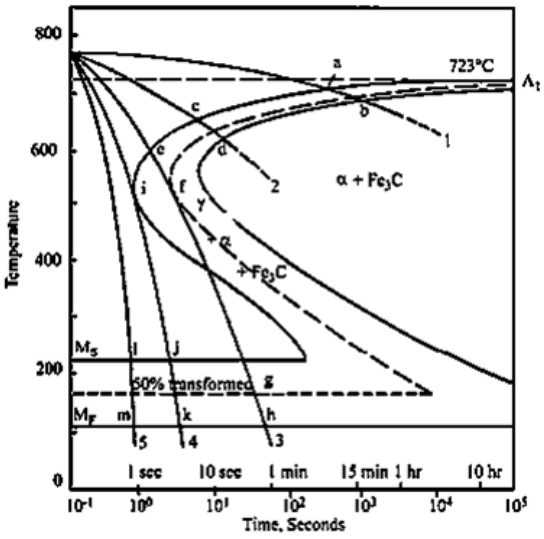
Instructions: ***All questions are compulsory. The question paper is consisting of 11 questions divided into 3 section A, B and C. Section A comprises of 5 questions of 4 marks each, Section B comprises of 4 questions of 10 marks each and Section C comprises of 2 questions of 20 marks each.***

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Discuss the manufacturing process for an inner door skin of an aircraft?	**4**	**CO1**
Q 2	At eutectic point determine the number of phases and degree of freedom. 	**4**	**CO1**
Q 3	Discuss the operating parameters required for getting microstructure shown in figure 1 and 2?  **Figure 1**  **Figure 2**	**4**	**CO1**
Q 4	It is difficult to shape nickel-based superalloys for jet engine components using forming processes. Illustrate?	**4**	**CO1**
Q 5	Discuss the casting process for the turbine blades shown in the figure?	**4**	**CO3**

			
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Find a direction common to (1 1 1) and (1 1 $\bar{1}$) using: (a) Weiss Zone Law **(3 Marks)** (b) Geometrical Method **(7 Marks)**	**10**	**CO3**
Q 7	Discuss the materials requirement for any of the five-aerospace structures shown in the figure? **(2 marks each)** 	**10**	**CO2**
Q 8	Using the iron-carbon phase diagram solve the following questions: (a) Describe the phases form for the eutectoid reaction. **(2 Marks)** (b) For a system in equilibrium containing 1.0 wt% carbon at 1200 ^{o}C, determine the phases exist and their weight fractions. **(4 Marks)** (c) For a system in equilibrium containing 2.5 wt% carbon at 1000 ^{o}C, determine the phase and their weight fraction. **(4 Marks)**  **OR**	**10**	**CO2**

	Discuss the various changes in microstructure that takes place during the very slow cooling from austenitic range for hypoeutectoid steel and hypereutectoid steel?		
Q 9	Discuss the various ways to increase the resistance against dislocation slip?	**10**	**CO2**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	The Time-Temperature-Transformation diagram describes the decomposition of alloys under non equilibrium conditions. The Figure shown below represents the TTT diagram of eutectoid steel (0.8% C). Name the heat treatment process which could take place on curve and the final constituents of the steel and show Austempering treatment curve. Also draw the sketch of microstructure for different cooling curve shown in the figure?	**20**	**CO3**



Curve No.	Heat Treatment	Final Constituents	Microstructure
1 **(3 Marks)**			
2 **(2 Marks)**			
3 **(5 Marks)**			
4 **(5 Marks)**			
5 **(5 Marks)**			

Q 11	In an orthogonal cutting operation, the following data have been observed: **Uncut chip thickness** **0.127 mm** **Width of cut** **6.35 mm** **Cutting Speed** **2 m/s** **Rake angle** **10^o** **Cutting Force** **567 N** **Thrust Force** **227 N** **Chip Thickness** **0.228 mm** Determine: (1) Shear angle (2) Friction angle (3) Shear stress along the shear plane (4) Power for cutting operation (5) Chip Velocity (**4 marks each)** **OR** (a) Sketch Merchant's circle diagram and explain the different quantities involved. **(8 Marks)** (b) Mild steel is being machined at a cutting speed of 210 m/min with a tool of rake angle 10^0. The width of cut and uncut chip thickness are 3 mm and 0.2 mm respectively. If the value of coefficient of friction between the tool and the chip is 0.5 and shear stress 400 N /mm^2. Determine: (1) The shear angle (2) Components of machining force. **(6 Marks each)**	**20**	**CO4**