

Name:  
Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2021**

**Course: Aircraft Materials**  
**Program: B. Tech ASE**  
**Course Code: ASEG 3005**

**Semester: VII**  
**Time 03 hrs.**  
**Max. Marks: 100**

**Instructions: a) All questions are compulsory**  
**b) Q1-Q3 are TRUE/FALSE**

**SECTION A**

S. No.		Marks	CO
Q 1	a) Single crystal materials are isotropic in nature. b) Addition of zirconium in magnesium increases the grain size of the solid	4	CO1
Q2.	a) In MMCs both fibre and matrix are load bearing constituents b) Magnesium alloys are anisotropic in nature	4	CO2
Q3.	a) Grain boundaries are not present in amorphous materials b) Creep resistance of beta titanium alloys are higher than alpha titanium	4	CO1
Q4.	a) HCP crystal are brittle than FCC b) Addition of copper in aluminum alloy improves its ductility	4	CO1
Q5.	Briefly explain the difference between alloys and composite materials	4	CO4

**SECTION B**

Q 6	Explain the age hardening processes of materials, clearly states different steps involved in the process, also mention the effect of age hardening on mechanical properties of materials.	10	CO1
Q7.	a) With the help of block diagram of turbofan jet engine, briefly explain the material for each section. (5 M) b) Explain the difference between the iron-nickel and cobalt superalloys, highlight the applications of both. (5M)	10	CO3
Q8.	Which material is used for making turbine blades, mention the ways by which the surface temperature of the blade material can be lowered.	10	CO2
Q9		10	CO3

	<p>a) A design engineer want to minimize the weight of the compressor rotor of the gas turbine engine by replacing the material it with composite. Which type of composite material he/she can use for the replacement. Comment on the selection with an example. (6 M)</p> <p>b) Explain the effect of carbon content on the mechanical properties of steel. (4 M)</p>		
<b>SECTION-C</b>			
Q10	<p>State the main load carried by following aircraft components and mention the suitable metal and composite material for each of these components,</p> <p>a) Fuselage and wing skin (subsonic and supersonic a/c)</p> <p>b) Wing ribs (subsonic a/c and supersonic a/c)</p> <p>c) Spars (subsonic (a/c)</p> <p>d) Turbofan blades</p> <p>e) Combustion chamber</p>	<b>20</b>	<b>CO2</b>
Q11.	<p>Explain the pultrusion process of making composite materials, clearly states its applications, advantages and disadvantages.</p> <p style="text-align: center;"><b>OR</b></p> <p>Explain the diffusion bonding process of making composite materials, clearly states its applications, advantages and disadvantages.</p>	<b>20</b>	<b>CO4</b>