Roll No: ----------

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech. Aerospace | **Semester : VII**
Subject (Course): Composite Materials and Structures | **Max. Marks : 100**
Course Code : ASEG431 | **Duration : 3 Hrs**
No. of page/s: 2

Instructions- Read all the below mentioned instructions carefully and follow them strictly

1) **Mention Roll No. at the top of the question paper**
2) **Do not write anything else on the question paper except your roll number**
3) **ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY**
4) **Internal choice is given for question number 12 and 13.**

Q. No.	Question	Maximum Marks	Course Outcome
	SECTION-A **Attempt All the Questions**		
1.	Describe electrophoretic process for preparation of metal matrix composites.	**[4]**	**CO2**
2.	Discuss the change of elastic modulus, yield strength and tensile strength in SiC_w reinforced Al matrix.	**[4]**	**CO3**
3.	Explain the role of filler in the polymer-derived ceramic matrix composites.	**[4]**	**CO3**
4.	Outline some applications of carbon-carbon composite in aircraft.	**[4]**	**CO4**
5.	Consider a laminated composite made by laminating sheets of two materials (1 and 2), each of volume, v, in an alternating sequence. Let the thickness of the laminae of the two materials be t1 and t2, and the number of sheets of each be N1 and N2, respectively. For a given volume fraction of component 1, V1 (remember that V1 + V2 = 1), derive an expression for the interfacial area as a function of t1 and t2.	**[4]**	**CO3**
	SECTION-B **Attempt All the Questions**		
6.	Illustrate the solid state process for the preparation of metal matrix composite.	**[8]**	**CO2**
7	Explain the change in the stress-strain properties in the Al matrix by reinforcing with SiC_p with different volume fraction and different particle size of SiC_p with given volume fraction.	**[8]**	**CO3**

8.	Describe any one method for preparation of glass fiber.	**[8]**	**CO1**
9.	What is the hot-pressing method for production of continuous fiber reinforced ceramic matrix composite? Explain with suitable schematic procedure.	**[8]**	**CO2**
10.	Explain different modes of crack propagation in ceramic matrix composite and variation of fracture strength and fracture toughness with different volume fraction of whiskers or particles reinforcement.	**[8]**	**CO3**
	SECTION- C **(Question No. 11 is Compulsory; Attempt any one from question number 12 and 13)**		
11.	Describe the polymer infiltration and pyrolysis method for the fabrication of ceramic matrix composite. Explain the problems and its prevention arising in the fabrication of carbon fiber reinforced Al-matrix composite.	**[12+8]**	**CO2**
12.	Explain the autoclave with prepreg and filament winding methods for the fabrication of polymer matrix composite. Discuss the moisture effects in polymer matrix composites	**[12+8]**	**CO2**
	or		
13.	Illustrate the processing of carbon/carbon composites by pyrolysis of carbon fiber/polymer composites. Discuss the mechanical and thermal properties of carbon/carbon composite.	**[10+10]**	**CO3**

Roll No: ----------

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech. Aerospace | **Semester : VII**
Subject (Course): Composite Materials and Structures | **Max. Marks : 100**
Course Code : ASEG431 | **Duration : 3 Hrs**
No. of page/s: 2

Instructions- Read all the below mentioned instructions carefully and follow them strictly

1) **Mention Roll No. at the top of the question paper**
2) **Do not write anything else on the question paper except your roll number**
3) **ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY**
4) **Internal choice is given for question number 12 and 13.**

Q. No.	Question	Maximum Marks	Course Outcome
	SECTION-A **Attempt All the Questions**		
1.	What do you mean by Kevlar fibers? What are the applications for which these fibers were developed?	**[4]**	**CO2**
2.	Describe a carbon-carbon composite material. Outline some applications of carbon-carbon composite.	**[4]**	**CO1**
3.	Explain the advantages and disadvantages of thermo-plastic matrices?	**[4]**	**CO1**
4.	Compare and discuss the stress-strain curve of brittle polymer, plastic and elastomers.	**[4]**	**CO3**
5.	What is Nicalon fiber? Explain brief synthesis of Nicalon fiber.	**[4]**	**CO1**
	SECTION-B **Attempt All the Questions**		
6.	Explain what do you mean by coupling agent? Describe the interfacial bonding in glass fiber/polymer composite taking organo-silane as coupling agent.	**[8]**	**CO3**
7	Silicon carbide (0.1 μm thick) coated boron fiber was used to reinforce a metallic matrix. The SiC coating serves as a diffusion barrier coating. Estimate the time for dissolution of this coating at 700 K if the diffusion coefficient at 700 K is 10^{-16} m^2/s.	**[8]**	**CO4**
8.	Describe sol-gel method for the preparation of ceramic fibers.	**[8]**	**CO2**
9.	What do you mean by Aramid fiber? Explain dry jet–wet spinning process of producing aramid fibers.	**[8]**	**CO1**

10.	Explain the directed oxidation method for the preparation of ceramic composite materials.	**[8]**	**CO2**
SECTION- C **(Question No. 11 is Compulsory; Attempt any one from question number 12 and 13)**			
11.	Explain the Squeeze casting technique of making a metal matrix composite. Discuss the variation of mechanical properties like elastic modulus, strength of continuous fiber, whiskers and particles reinforced metal matrix composite.	**[10+10]**	**CO1**
12.	Describe with suitable reaction and scheme how polymer can be used as matrix for preparation of ceramic matrix composite. What do you mean by micro-cracking in ceramic matrix composite?	**[12+8]**	**CO2**
	or		
13.	Describe any one method for the preparation of carbon fiber/carbon matrix composite. What are the different methods for oxidation protection of carbon fiber/carbon matrix composite?	**[12+8]**	**CO3**