

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Synthesis and application of composites and nanocomposites

Semester: VII

Program: B.Tech. ME-Spz-MS&NT

Time 03 hrs.

Course Code: MTEG-415

Max. Marks: 100

Instructions: **1. The Question paper has three sections: Section A, B and C.**
2. Section B and C have internal choices.

SECTION A

S. No.		Marks	CO
Q 1	Classify the different welding methods of polymer composites.	4	CO1
Q 2	Calculate the composite modulus for polyester reinforced with 60 vol% E-glass under iso-strain conditions. Given: $E_{\text{polyester}} = 6.9 \times 10^3 \text{ MPa}$ and $E_{\text{E-glass}} = 72.4 \times 10^3 \text{ MPa}$.	4	CO1
Q 3	Categorize the composites on the basis of the fillers and their distribution.	4	CO1
Q 4	Describe in-service defects of composites.	4	CO2
Q 5	Clarify Griffith theory of brittle fracture of the composites.	4	CO4

SECTION B

Q 6	Discuss the importance of superhydrophobic nanocomposites coatings and their self-cleaning applications for various industries.	10	CO4
Q 7	Explain the crack pinning and plastic void growth mechanisms of nanoparticle reinforced polymer nanocomposites.	10	CO2
Q 8	Categorize welding processes. Describe the following arc welding processes: a) Shielded Metal Arc Welding b) Gas Metal Arc Welding	10	CO1
Q 9	Describe the functions of primary phase, secondary phase and objectives of metal-matrix composites.	10	CO2

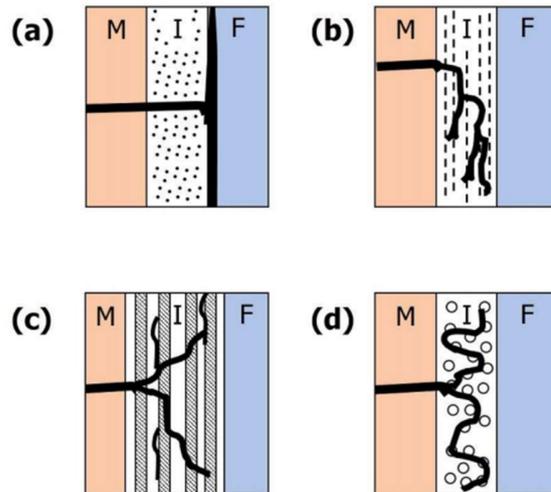
OR

Explain the solid-state diffusion bonding process of metal-matrix composite with schematic diagrams.

SECTION-C

Q 10

Analyze the type of interphase in ceramic matrix composites (CMCs) as shown below. Where M stands for matrix, F stands for filler and I stands for interphase. Discuss each type of interphase in detail. Explain the chemical vapor infiltration technique for the fabrication of CMCs and mention its advantages and disadvantages.

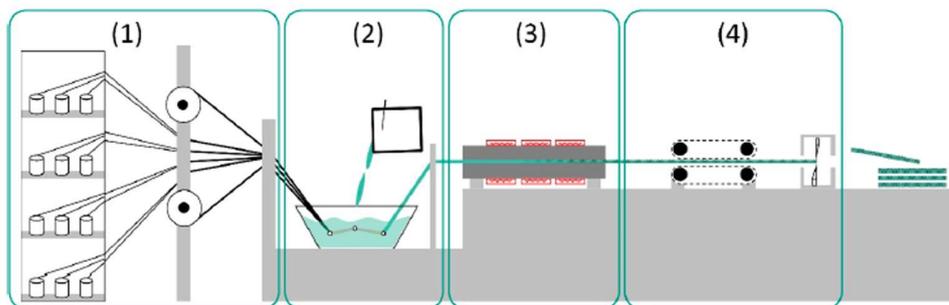


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CO3

Q 11

Analyze the basic elements of an open impregnation-bath pultrusion-line for the fabrication of glass-fiber reinforced epoxy composites as shown below. Identify the control parameters of the pultrusion process and discuss the effect of pulling speed, fiber volume fraction, curing temperature, reaction kinetics with resin shrinkage and the compression ratio at the injection point on the mechanical properties of the fabricated composites.



OR

Analyze the failures types arising from the machining of Carbon fiber reinforced polymer composite (CFRP) composite materials responsible for the reduced strength

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CO3