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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech MSENT
Subject (Course): Nano Composite
Course Code: MTEG-411
No. of pages: 2

Semester – VII
Max. Marks : 100
Duration : 3 Hrs

Instructions:

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

Section A (Attempt ALL questions)			
1.	Mention at least ten potential applications of polymer nanocomposites.	[5]	CO1
2.	Summarize five in-service defects in composites.	[5]	CO2
3.	Classify the nanocomposites.	[5]	CO1
4.	Determine the composite modulus for polyester reinforced with 60 vol% E-glass under iso-strain conditions. Given: $E_{\text{polyester}} = 6.9 \times 10^3$ MPa and $E_{\text{E-glass}} = 72.4 \times 10^3$ MPa.	[5]	CO2
Section B (Attempt ALL questions)			
5.	Describe basic principles of polymer nanocomposite welding along with fundamental welding steps.	[10]	CO3
6.	Explain the Griffith theory of brittle fracture and modification for structural materials.	[10]	CO4
7.	Describe metal matrix composites and mention pointwise objectives of reinforcements of the metals.	[10]	CO2

8.	<p>Describe the superhydrophobic nanocomposite materials, their applications and limitations.</p> <p style="text-align: center;">OR</p> <p>Describe nano-lubricants and their primary as well as secondary functions in automotive industry.</p>	[10]	CO3
Section C (Attempt ALL questions)			
9.	<p>Describe the following terms:</p> <ul style="list-style-type: none"> i. Categories of welding Processes ii. Arc Welding iii. Electric Arc iv. Arc Time v. Consumable Electrodes vi. Non-consumable Electrodes vii. Flux 	[20]	CO3
10.	<p>Explain five toughening mechanisms of nanoparticulate reinforced polymer composites.</p> <p style="text-align: center;">OR</p> <p>Explain the liquid infiltration and chemical vapor impregnation process for preparation of ceramic matrix composites.</p>	[20]	CO2

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Name of the College (Please tick, symbol is given)	:	COES	✓	CMES		COLS	
Program	:	B.Tech. MSENT					
Semester	:	VII					
Name of the Subject (Course)	:	Nano Composite					
Course Code	:	MTEG-411					
Name of Question Paper Setter	:	Dr. MANJEET SINGH GOYAT					
Employee Code	:	40001115					
Mobile & Extension	:	9756973500 & 1416					
Note: Please mention additional Stationery to be provided, during examination such as Table/Graph Sheet etc. else mention "NOT APPLICABLE": NOT APPLICABLE.							
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Note: - Pl. start your question paper from next page

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Section A (Attempt ALL questions)			
1.	Classify the fiber reinforced composite materials.	[5]	CO1
2.	Mention the potential factors responsible for controlling the mechanical properties of composites.	[5]	CO1
3.	Distinguish Thermoset and Thermoplastic polymer materials.	[5]	CO1
4.	Classify ceramic materials.	[5]	CO2
Section B (Attempt ALL questions)			
5.	Distinguish ductile and brittle fracture. Explain Griffith theory of brittle fracture.	[10]	CO4
6.	Explain particle-debonding, crack pinning and crack bending mechanisms of epoxy nanocomposites.	[10]	CO2
7.	Describe primary and secondary functions of nano-lubricants in automotive industry.	[10]	CO3

8.	<p>Mention the advantages and limitations of ceramic nanocomposite processing methods.</p> <p style="text-align: center;">OR</p> <p>Draw the flow chart for conventional powder method and polymer precursor route used in the synthesis of an Al₂O₃/SiC nanocomposite.</p>	[10]	CO2
Section C (Attempt ALL questions)			
9.	<p>Explain scanning electron microscopy and atomic force microscopy characterization techniques in detail with the help of suitable diagrams.</p>	[20]	CO2
10.	<p>Describe shielded metal arc welding (SMAW) and gas metal arc welding (GMAW). Mention the GMAW advantages over SMAW.</p> <p style="text-align: center;">OR</p> <p>Explain the following techniques:</p> <ul style="list-style-type: none"> a) Flux-Cored Arc Welding (FCAW) b) Electrode Gas Welding (EGW) c) Submerged Arc Welding d) Plasma Arc Welding (PAW) 	[20]	CO3