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# GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Eight Semester – Regular) Examinations, April – 2024

## BPME8011 – Composite Materials

(Mechanical)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

### PART – A: (Multiple Choice Questions)

(1 x 10 = 10 Marks)

#### Q.1. Answer **ALL** questions

- |   | [CO#] | [PO#] |
|---|-------|-------|
| a. Composites can be classified based on _____.   | CO1   | PO1   |
| i. matrix type  |       |       |
| ii. reinforcement constituent   |       |       |
| iii. matrix type & reinforcement constituent  |       |       |
| iv. None  |       |       |
| b. Which of the following does not combine with fiber to give composites?   | CO1   | PO1   |
| i. Metals   |       |       |
| ii. Ceramics  |       |       |
| iii. Non-metals   |       |       |
| iv. Polymers  |       |       |
| c. The metal used as in matrix in metal matrix composites   | CO2   | PO1   |
| i. Nickel   |       |       |
| ii. Lead  |       |       |
| iii. Boron  |       |       |
| iv. Titanium  |       |       |
| d. Which of the following is not a desired property of a Matrix?  | CO2   | PO1   |
| i. Increased moisture absorption  |       |       |
| ii. Low shrinkage   |       |       |
| iii. Dimensional stability  |       |       |
| iv. Low temperature capability  |       |       |
| e. The cermets are example of   | CO3   | PO1   |
| i. ceramic-metal composites   |       |       |
| ii. metal-metal composites  |       |       |
| iii. ceramic-polymer composites   |       |       |
| iv. metal-polymer composites  |       |       |
| f. Which of the following ceramic materials comes under the category of traditional ceramics                                | CO3   | PO1   |
| i. Silicon carbide  |       |       |
| ii. Alumina   |       |       |
| iii. Titanium Carbide   |       |       |
| iv. Tungsten Carbide  |       |       |
| g. In _____ it's a challenge to control the fiber volume fraction.  | CO4   | PO1   |
| i. Hand lay-up  |       |       |
| ii. Injection molding   |       |       |
| iii. Pultrusion   |       |       |
| iv. Spray lay-up  |       |       |
| h. The working principle of pultrusion is almost similar in nature to which one of the following plastic forming processes? | CO4   | PO1   |
| i. Blow molding   |       |       |
| ii. Extrusion   |       |       |
| iii. Injection molding  |       |       |
| iv. Thermoforming   |       |       |
| i. Which of the following is not an advantage of composites?  | CO1   | PO1   |
| i. Easy to manufacture and durable  |       |       |
| ii. Excellent thermal, mechanical, and chemical properties  |       |       |
| iii. Heavy-weight and non-versatile   |       |       |
| iv. Economical and tailor made  |       |       |
| j. Advanced composites are  | CO2   | PO1   |
| i. those that are found naturally.  |       |       |
| ii. those used traditionally in aerospace industries.   |       |       |
| iii. those that have low performance  |       |       |
| iv. None  |       |       |

**PART – B: (Short Answer Questions)****(2 x 10 = 20 Marks)**Q.2. Answer ALL questions

	[CO#]	[PO#]
a. Define the term “aspect ratio” for a fibre.	CO1	PO1
b. How are the fibres arranged within a composite?	CO1	PO1
c. State few applications of MMCs	CO2	PO1
d. What are the constituent in composite materials?	CO2	PO1
e. Define Flake composite with sketch	CO2	PO1
f. List out some conventional matrix material used in CMCs.	CO3	PO1
g. What are the application of carbon-carbon composites?	CO3	PO1
h. What are the application of carbon-carbon composites	CO3	PO1
i. Define hybrid composites.	CO4	PO2
j. List out some commonly used fibres for PMCs	CO4	PO1

**PART – C: (Long Answer Questions)****(10 x 4 = 40 Marks)**Answer ALL questions

	Marks	[CO#]	[PO#]
3. a. Give the characteristics of composite materials. Also give the classification of composites based on matrix and reinforcement?	10	CO1	PO1
<b>(OR)</b>			
b. List and briefly explain the characteristics of natural fiber polymer matrix composite .	5	CO1	PO1
c. What do you mean by isotropic material? State examples	5	CO1	PO1
4. a. What is ceramic matrix composites? What is solid state method of ceramic matrix composites?	6	CO2	PO2
b. What is the processing method of ceramic matrix composites?	4	CO2	PO1
<b>(OR)</b>			
c. Explain in brief with neat sketches the squeeze casting techniques.	10	CO2	PO1
5. a. Explain any one Processing technique of alumina matrix composites. Also mention its properties and applications.	10	CO3	PO1
<b>(OR)</b>			
b. What are the manufacturing processes of metal matrix composites? And also write down some applications of metal matrix composites	4	CO3	PO1
c. What are porous carbon material and carbon-carbon composites? Why carbon-carbon composites are used in spacecraft?	6	CO3	PO2
6. a. What is ceramic matrix composite material? Give their some applications and examples.	5	CO4	PO1
b. Derive the expression for Young’s modulus of the composites during longitudinal and transverse loading.	5	CO4	PO2
<b>(OR)</b>			
c. Calculate the ratio of longitudinal modulus of the composite to the matrix modulus for glass-epoxy and carbon-epoxy composites with 10 and 50 % fibres by volume. Elastic moduli of glass fibres, carbon fibres and epoxy resin are 70, 350 and 3.5 GPa, respectively.	10	CO4	PO2

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