**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**
**End Semester Examination, May 2020**

Course: Composite Material                                                      Semester: VIII
Program: B. Tech ASE                                                            Time 03 hrs.
Course Code: MTEG 415                                                      Max. Marks: 100

**Instructions: Q.1-Q.6 are of multiple choice type. (6*2 Marks)**
**Q.7. is True/False with 9 sub questions carry 2 marks each (9*2 Marks)**
**Q.8-Q.13 are of short answer type with not more than 70 words (6*5 Marks)**
**Q.14-Q.15 are of long answer type with not more than 150 words (2*10 Marks)**
**Q.16 is of long answer type with not more than 250 words (20*1 Marks)**

## SECTION A

| S. No. | | Marks | CO |
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| Q 1 | Which of these is a solid state process of making composites.<br><br>a) Resin transfer molding<br>b) Squeeze casting<br>c) Diffusion bonding<br>d) Filament winding. | 2 | CO2 |
| Q 2 | Voigt model provides _____ bound of mechanical properties of composites in longitudinal direction<br><br>a) Upper<br>b) Lower<br>c) Both<br>d) Middle | 2 | CO2 |
| Q3 | The material added to increase the wetability of matrix in MMC is<br>a) Chromium<br>b) Cobalt<br>c) Magnesium<br>d) Silicon | 2 | CO2 |
| Q4. | The ultimate strength of unidirectional composites: titanium alloy metal matrix composite (TMC), SiC-SiC ceramic matrix composite (SCS) and Kevlar reinforced epoxy composite (KEC) in the increasing order is,<br><br>a) KEC, SCS, TMC<br>b) KEC, TMC, SCS, | 2 | CO2 |

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|---|---|---|---|
| | c) TMC, SCS, KEC<br>d) TMC, KEC, SCS | | |
| Q5. | The diameter of the fiber _____ during the CVI fabrication process<br><br>a) Increases<br>b) Decreases<br>c) Remain constant<br>d) None of the above | **2** | **CO2** |
| Q6. | For a given fiber the toughness of composite can be increased by i) Increasing fiber volume fraction ii) weak fiber matrix interface, iii) using ductile matrix, iv) using brittle matrix.<br><br>a) i and ii<br>b) ii and iii<br>c) i and iii<br>d) iii and iv | **2** | **CO2** |
| Q7. | State True/False for the following questions<br><br>a) Both fiber- mat and bundles of filaments are treated as unidirectional fiber composites.<br>b) In composite material reinforcement is insoluble.<br>c) Aspect ratio of short fibre is less than 10.<br>d) Compacting is hot pressing and sintering is cold compression process in powder metallurgy.<br>e) Reinforcement of short, long, or particulate types can be used for making CMCs by liquid infiltration process.<br>f) Binding of fibers in composite are not possible if volume fraction of fiber is 1<br>g) MMC with high hardness suitable for wear resistance application.<br>h) Processing temperature of making MMC must be higher than CMCs.<br>i) The young modulus of matrix in PMC is larger than fiber. | **18** | **CO1** |
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| Q 8 | Define representative volume element (RVE), and also state the rule of mixture of composite. | **5** | **CO4** |
| Q 9 | Why longitudinal modulus of composite in unidirectional composite is stronger than transverse modulus.? | **5** | **CO5** |
| Q 10 | State the possible failure modes in Composites. | **5** | **CO5** |
| Q 11 | Difference between preform and prepreg. | **5** | **CO4** |
| Q 12 | Mention the reasons of adding wetability agent in chemical vapor deposition process of making CMCs. | **5** | **CO3** |

| Q 13 | State the reason of using thermoset matrix in resin transfer and filament winding process of making composite material | 5 | CO3 |
|---|---|---|---|
| Q14 | List the main steps in powder metallurgy process (do not explain) also list out the controlling parameters of blending process. **OR** Explain open mold processing of making PMC and list out its advantage and disadvantages | 10 | CO3 |
| Q 15 | Explain the function of fibre and matrix in the composite. Give one example of each PMC, CMC, and MMC. | 10 | CO4 |
| | | | |
| Q 16 | a) Explain the powder metallurgy process of making CMCs b) Difference between Cold isostatic pressing (CIPing) and Hot isostatic pressing (HIPing) manufacturing process of ceramic matrix composite. **OR** Explain the steps in slurry impregnation technique of making CMCs. Cleary state its advantages and disadvantages. | 20 | CO3 |