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## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, M. Tech – Mechanical Engineering (MCIM)

Semester End Examination; Jan/Feb. - 2016

Advanced Materials Technology

Time: 3 hrs

Max. Marks: 100

**Note:** Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.

### UNIT - I

- 1 a. Briefly describe a twin and a twin boundary with neat sketch. 4
- b. Explain covalent bond and secondary bonds. 6
- c. Define composite material and explain the classification of composites. 10
- 2 a. What fiber factors contribute to the mechanical performance of a composite? 4
- b. Prove that  $E_f = E_f V_f + E_m V_m$  also write the assumptions. 10
- c. Differentiate between thermo sets and thermo plastics. 6

### UNIT - II

- 3 a. Explain with a neat sketch development of MMC using diffusion bonding. 10
- b. List the important requirement of reinforcement material used in MMC. 4
- c. Sketch and explain the manufacturing process of glass fibers. 6
- 4 a. Describe the following with respect to composite processing :
  - i) Filament winding 14
  - ii) Pultrusion.
- b. With a neat sketch explain hand Layup process. 6

### UNIT - III

- 5 a. List the methods used for the production of powders. Explain any one method. 8
- b. Differentiate between CIP and HIP clearly. 4
- c. Explain HIP with neat sketch. What parameters are crucial in the process? Explain. 8
- 6 a. With a neat flow diagram, explain powder metallurgy rate for the production of metal matrix composites. 10
- b. Explain Sintering and compaction. 4
- c. List the application of the powder metallurgy. 6

### UNIT - IV

- 7 a. With a neat sketch explain surface treatment of metal. 6
- b. What do you understand by surface texture and surface integrity? Elaborate. 6
- c. List various surface defects and explain why the surface treatment of manufactured products may be necessary. 8

- 8 a. Briefly describe the different techniques used in mechanical surface treatment. 10
- b. Explain the chemical vapour deposition process with a neat sketch. List its advantages and applications. 10

**UNIT - V**

- 9 a. Write a brief note on nanomaterials. 5
- b. Explain clearly plasma arcing method used for preparing nanomaterials with a neat sketch. 10
- c. With a neat sketch explain the Sol-gel method. 5
- 10 a. Write a note on nanotubes. 6
- b. With neat sketches, briefly explain AFM and SPM techniques for nano characterization. 14

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