Ex/PG/ME/T/129I/2024

Master of Engineering in Mechanical Engineering Examination, 2024

(2nd Semester)

Subject: Advanced Manufacturing Processes

Time: Three hours **Full Marks: 100**

(*Answer Any Five Questions*)

1. a) What are the steps involved in making useful products from ceramics? What role does additives play in shaping of the ceramics ? 12

   b) Explain any two basic shaping processes for ceramics. 08

2. a) What are Metal-Matrix and Ceramic-Matrix composites? Give examples, advantages and application areas of the same? 10

   b) What is *isostrain* and *isostress* loading of fibre composites? Which is advantageous and why? 10

3. a) Explain with the help of a neat sketch the extrusion OR injection molding process for shaping of plastics. 08

   c) What is Nanometrology? Why is it important? Give examples of any two nanometrology measurement techniques along with their applications. 12

4. a) Write short notes on:(any two)

   i)CMM (Coordinate Measuring Machine), ii)Fourier Transform Infrared Spectroscopy iii) 3D Scanning iv) Laser Interferometer 12

   b) Differentiate between Contact Metrology and Non-contact Metrology citing examples. 08

5. a) A solid cylindrical ceramic part is to be made whose final length must be L=25 mm. It has been established that for this material, linear shrinkages during drying and firing are 9% and 5%, respectively, based on the dried dimension L_d, Calculate (i) the initial length L_o of the part and (ii) the dried porosity P_d if the porosity of the fired part, P_f is 4%. 10

b) Suppose that we have a 0.5-in^2 (323-mm^2) bar that is 60% glass and 40% polyester by volume. What are the stresses and strains in the individual components? Assume loading parallel to the fibres, or iso-strain loading. 10

6. a) Describe briefly the Chemical Vapour Deposition(CVD) or the Physical Vapour Deposition(PVD) process listing its advantages and disadvantages. 10

b) Differentiate between subtractive, additive and virtual Rapid Prototyping (RP). Explain the Fused-deposition modeling(FDM) process. 10

7. a) Explain the key concepts in Intelligent Manufacturing. What are key technologies involved in its implementation ? 12

b) What are the challenges in implementing Intelligent Manufacturing? 08