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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S8 (R,S) Exam April 2025 (2019 Scheme)

**Course Code: MET464**

**Course Name: MICRO AND NANO MANUFACTURING**

**Duration: 3 Hours**

**Max. Marks: 100**

**PART A**

*Answer all questions, each carries 3 marks.*

Marks

- |    |                                                                                                |     |
|----|------------------------------------------------------------------------------------------------|-----|
| 1  | Discuss the purpose of Micromachining                                                          | (3) |
| 2  | With the help of an application explain the micro extrusion processes.                         | (3) |
| 3  | Discuss the principle of Focused Ion Beams. Give the applications                              | (3) |
| 4  | Explain the effects of process parameters of Micro Electro Chemical machining process          | (3) |
| 5  | Explain the influence of process parameters in MR jet finishing process                        | (3) |
| 6  | Explain the role of carbonyl iron particles (CIP) in Magnetorheological (MR) finishing process | (3) |
| 7  | Explain the mechanical and physical properties of Carbon Nanotubes (CNT)                       | (3) |
| 8  | List any three applications of manipulation techniques                                         | (3) |
| 9  | Write down the advantages and limitations of Laser Micro Welding                               | (3) |
| 10 | Explain about the merits and demerits on On-Machine Metrology                                  | (3) |

**PART B**

*Answer any one full question from each module, each carries 14 marks.*

**Module I**

- |    |                                                                                                 |      |
|----|-------------------------------------------------------------------------------------------------|------|
| 11 | a) Explain about the advantages and applications of MEMS                                        | (4)  |
|    | b) With the help of neat sketches explain about Bulk micromachining and Surface micromachining. | (10) |

**OR**

- |    |                                                                                                                                         |     |
|----|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| 12 | a) With neat sketches explain Diamond micro turning process and its applications                                                        | (8) |
|    | b) Explain about the tool failure in micro drilling process? What are the remedies to eliminate tool failure in micro drilling process? | (6) |

**Module II**

- |    |                                                                               |     |
|----|-------------------------------------------------------------------------------|-----|
| 13 | a) Discuss different non-conventional micro and nanomanufacturing techniques. | (4) |
|----|-------------------------------------------------------------------------------|-----|



- b) With neat sketch explain micro electron beam machining process, parameters, and applications (10)

**OR**

- 14 a) Explain the advantages, disadvantages, and applications of Micro Electrical Discharge Machining process (6)
- b) Discuss the principle, and applications of various methods of micro molding process. (8)

**Module III**

- 15 a) With the help of a schematic diagram explain the working principle of Ion Beam Machining (7)
- b) Explain the mechanism of material removal, applications of Chemical Mechanical Polishing (CMP) with the help of a schematic diagram (7)

**OR**

- 16 a) Explain the Magnetorheological Finishing (MRF) process. Give the applications of MRF process (6)
- b) Explain the working principle of Magnetorheological Abrasive Flow Finishing (MRAFF) process with schematic figure (8)

**Module IV**

- 17 a) Draw and explain the fabrication steps involved in LIGA process (6)
- b) Discuss the synthesis of Carbon Nanotubes (CNT) by CVD technology (8)

**OR**

- 18 a) Discuss the importance of Carbon Nano materials (4)
- b) Explain the principle and applications of nanofabrication using soft lithography (10)

**Module V**

- 19 a) Discuss the importance of Micro and Nano measurement (4)
- b) Explain the process, principle of Scanning Electron Microscopy with neat sketch. (10)

**OR**

- 20 a) Discuss the process of nanofabrication using Electron beam lithography. Also compare the features of photolithography and electron beam lithography in the context of Micro and Nano fabrication. (10)
- b) Discuss about confocal microscopy. Mention any one application. (4)

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