Ref. No. Ex/PG/ProdE/T/127A/2024

M.E. PRODUCTION ENGINEERING FIRST YEAR SECOND SEMESTER EXAMINATION - 2024

Subject: Nano-Technology & Micro-Machining (PT)

Time : Three Hours
Full Marks: 100

Use Separate Answer Script for Each Part

PART I (40 for Part I)

Answer Any Two Questions

Q1.

a) What is a Micro Electro Mechanical system (MEMS)? Describe the essential elements of MEMS. 6

b) Explain the following processes in respect of micro manufacturing: i) Lithography, ii) Electro plating, (4 + 5)

c) Discuss with suitable examples how 'Surface Micro-machining' is different from 'Bulk Micro- machining'. 5

Q2.

a) Make a comparative analysis of Chemical & Physical Vapour deposition techniques.

b) With suitable diagrams explain the following deposition processes: i) Casting, and ii) Sputtering

c) Explain in detail how mirror surface finish can be achieved by ELID grinding.

4+8+8

Q3.

a) State the objectives of nano- metrology. Differentiate between Industrial and Research oriented nano-metrology.

b) With suitable diagrams explain the principle of Scanning Electron Microscopy.

c) Define Nano-material. What is a one dimensional Nano-material? State some industrial applications of nano-materials.

6+7+7

[Turn over

Ref. No.: Ex/PG/ProdE/T/127A/2024

MASTER OF PRODUCTION ENGG. EXAMINATION, 2024
(2nd Semester)
SUBJECT – **NANO-TECHNOLOGY AND MICRO-MACHINING**

Time: Three hours Marks: 100

Use separate answer-script for each part.

PART- II (Marks: 60)
Answer any ***three*** questions

1.	(a) What are the different basic approaches for Micro-Fabrication? Define "Nano-Technology" and "Micro-Machining".	10
	(b) Classify various micro machining and nano finishing process.	10
2.	(a) Describe Electrochemical Micro-Machining (EMM) process with the aid of a schematic diagram of all the major sub-systems.	10
	(b) Represent an equivalent circuit model of inter electrode gap in EMM.	5
	(c) On the basis of various characteristics, differentiate between EMM and ECM.	5
3.	(a) What is Micro-EDM? Differentiate between Micro-EDM and conventional EDM.	8
	(b) Classify types of Micro-EDM.	4
	(c) Describe some additional devices utilized for in-situ fabrication of microelectrodes with micro-EDM setup.	8
4.	(a) What are the advantages of Electron Beam Machining (EBM) over other micro machining processes?	6
	(b) Explain the basic working principal of EBM with a schematic diagram.	8
	(c) Explain Electron Beam Drilling method.	6
5.	(a) Identify Focused Ion Beam machining (FIB) for different applications during micro fabrication.	6
	(b) Explain FIB milling and its scanning strategy during micro machining.	8
	(c) Identify different applications of FIB machining.	6