

M.E. PRODUCTION ENGINEERING FIRST YEAR SECOND SEMESTER EXAMINATION 2018

Subject: Nano-Technology & Micro-Machining

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) With suitable example explain 'Surface Micro-machining'. What is a Micro Electro Mechanical system (MEMS)? Describe the essential elements of MEMS. 12
- b) Explain the following process in respect of micro manufacturing: Lithography 08

Q2.

- a) Make a comparative analysis of Chemical & Physical Vapour deposition techniques.
- b) With suitable diagrams explain the following deposition processes: i) Casting, ii) Sputtering
- c) Explain how mirror surface finish can be achieved by ELID grinding.

5+10+5

Q3.

- a) Define Nano-material. What is a one dimensional Nano-material? State some industrial applications of nano-materials.
- b) State the objectives of nano- metrology. Differentiate between Industrial and Research oriented nano-metrology.
- c) With suitable diagrams explain the principle of Scanning Electron Microscopy.

7+6+7

MASTER OF PRODUCTION ENGG. EXAMINATION, 2018
(2nd Semester)
SUBJECT – NANO-TECHNOLOGY AND MICRO-MACHINING

Time: Three hours

Full Marks: 60

Use a separate answer-script for each part.

No of Questions	PART- II	Marks
	Answer any <i>three</i> questions	
1.	(a) Define “Micro-Machining” and differentiate between micro-machining and nano-technology. (b) Identify three categories of machining based on achievable accuracy. (c) Highlight on various tool and workpiece positioning techniques in the context of machining accuracy. (d) Identify some measuring techniques when machining accuracy level ranges below 0.01 micron.	6 4 6 4
2.	(a) Explain major advantages and limitations of the ultraprecision polishing techniques. (b) What are the advantages of atomic-bit material polishing methods over other conventional polishing techniques during polishing of hard brittle materials? (c) Explain in brief following ultra precision polishing techniques: (i) Elastic Emission Machining (EMM), (ii) Mechano -Chemical Polishing.	6 4 10
3.	(a) What are the advantages of Electrochemical Micro Machining (EMM) over other micro-machining techniques? (b) Explain the role of tool vibration over machining responses in EMM. (c) Identify some typical application of EMM technology for micro-machining of various components.	6 6 8
4.	(a) Explain in brief the basic principle of Ion Beam Machining. (b) Classify ion beam processing equipments on the basis of construction of ion sources and describe them in gist. (c) What is sputtering rate ‘S’? How it is influenced by major ion beam parameters. Explain in brief.	4 10 6
5.	Write short notes on (any two): (i) Problematic areas of Micro-EDM, (ii) Electron Beam micro-machining, (iii) Magneto Rheological Finishing (MRF), (iv) Micro-WEDM.	2 X 10