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MANIPAL INSTITUTE OF TECHNOLOGY Manipal University, Manipal – 576 104



VII SEM. B.Tech. (MECHANICAL/IP ENGG.) DEGREE END SEMESTER (MAKE UP) EXAMINATIONS DEC 2015 /JAN 2016

SUBJECT: NANOTECHNOLOGY (MME 451) REVISED CREDIT SYSTEM

Time: 3 Hours.

MAX.MARKS: 50

Instructions to Candidates:

✤ Answer ANY FIVE FULL questions.

1A) 1B) 1C)	How nano-positioning is achieved using elastic hinge or spring guide? Draw sketches of linear and torsional elastic hinge. Explain the control system of laser interferometrically controlled ruling engine. Explain electric field evaporation of specified atoms.	(03) (04) (03)
2A) 2B) 2C)	What do you mean by in-process measurement? With suitable diagram explain an example of in-process measurement and machining control. Is it possible to realize atomic - bit machining by using the sharp edge of an ordinary solid tool or the fixed abrasive of a grinding wheel? Justify your answer in brief. With neat sketches explain directional photon beam processing.	(04) (02) (04)
3A) 3B) 3C)	Explain the concept of non-friction servo system. Explain the force regimes and modes of operation in Atomic Force Microscopy (AFM). State three applications of AFM. Explain briefly the resist process in nanolithography.	(02) (03) (05)
4A) 4B) 4C)	With a neat and labelled sketch explain the working of Coreless moving coil type electrodynamic positioner or voice coil linear actuator. Explain manipulation of atoms using Scanning Electron Microscope. Explain how nanotechnology can make a significant difference in developing nations.	(03) (02) (05)

(MME 451)

Page 1 of 2

- 5A) Explain the fabrication process of ultra-precision block gauges. (04)
- **5B)** Explain electron beam lithography writing strategies.
- 5C) With a neat sketch explain the working of circular path interferometer used for surface roughness measurement. (03)
- **6A)** Explain the force displacement relationship in micro rolling motion of **(03)** linear roller bearings.
- **6B)** Write a short note on spintronics and carbon electronics. Explain how it **(04)** can give Moore's law a new lease of life.
- **6C)** Write a short note on atom cluster processing by conventional material **(03)** removal processes such as turning, grinding, lapping and polishing.

(03)