

**Time: 2 ½ hr****Total Marks: 60****N. B. (1) All questions are compulsory****(2) All questions carry equal marks****(3) Marks assigned to each question are written against the questions****(4) Use of scientific calculator is allowed**

Q.1. (A) Attempt any one [8]

(1) Sketch the energy band diagram, charge distribution, electric field distribution and potential distribution of an ideal MOS diode.

(2) Draw a labeled diagram and explain I-V characteristics of MOSFET under ideal condition and determine the channel conductance and transconductance

B) Attempt any one [4]

(a) Write short note on non volatile memory devices

(b) Write note on Si-SiO<sub>2</sub> MOS diode with energy band diagram

Q.2 (A) Attempt any one [8]

(1) Explain the concept of tunnelling and with labeled diagram explain the current-voltage characteristic of tunnel diode?

(2) Describe thyristor and explain I-V characteristics of thyristor with the help of suitable diagram.

(B) Attempt any one [4]

(a) Write note on Gunn diode

(b) Write note on transferred electron devices

3. (A) Attempt any one [8]

(1) Explain in detail construction and theory of light emitting diode (LED) and explain its application.

(2) What are the fibre materials? Explain fibre optical waveguide and transportation of light signal? Explain any one technique to manufacture the optical fibre.

(B) Attempt any one [4]

(a) Write note on solar cells.

(b) Explain quantum confined Stark effect

Q. 4 (A) Attempt any one [8]

(1) Explain briefly the theory of colloids. How are the metal nanoparticles synthesized by the colloidal method.

(2) Explain Quantum dots, Quantum wires and Quantum wells and bulk materials.

(B) Attempt any one [4]

(a) Write note on carbon nanostructures

(b) Define nanomaterials and discuss briefly any one method to synthesize semiconductor nanocrystals

**Turn Over**

Q.5 Attempt any Four

[12]

- (1) Write note on buried channel devices
  - (2) Explain in short charge coupled devices
  - (3) Write short note microwave transistor
  - (4) Write note on hot electron transistor
  - (5) Discuss the applications of semiconductor laser
  - (6) Write note on photo-detectors
  - (7) Write note on microelectromechanical (MEMS) system
  - (8) Write note on nanotechnology
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