

Roll No.

(12/24)

15403

M.Sc. EXAMINATION

(For Batch 2021 & Onwards)

(First Semester)

PHYSICS

M.Sc./PHY/1/CC3

Fundamental of Electronics

Time : Three Hours

Maximum Marks : 70

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

1. (a) Give some points of superiority of FETs over conventional transistors.
(b) A silicon diode has a reverse saturation current of $2.5 \mu\text{A}$ at 300 K. Find forward voltage for a forward current of 10 mA.

- (c) Explain, how MOSFET can act as a register.
- (d) Prepare a truth table of the following Boolean expression : $A(\bar{B} + \bar{C}) + A\bar{B}$.
- (e) Determine the output voltage of an OP-AMP for an input voltage of $V_{i1} = 150 \mu\text{V}$ and $V_{i2} = 140 \mu\text{V}$. The amplifier has a differential gain of $A_d = 5000$ and a value of $\text{CMRR} = 200$. $2 \times 5 = 10$

Unit I

2. Giving relevant defining equations, explain the phenomenon of drift and diffusion associated with carrier movement in semiconductors. 15
3. Compare the characteristics of the transistor amplifier in three possible configurations using the Ebers-Moll model. 15

Unit II

4. (a) Explain the working of a JFET. Define the parameters of a JFET and develop its equivalent circuit. 10
- (b) Determine the value of transconductance of an FET when drain current changes from 1 mA to 1.5 mA with a change in gate voltage from -2.125 V to -2 V . 5
5. Explain the construction and operation of N-Channel and Channel enhancement of MOSFET. Why P-Channel enhancement FET is popular in MOS systems ? 15

Unit III

6. State and prove De-Morgan's theorems. Discuss the workings of the half adder and full adder and give their truth tables. 15
7. What are Flip-flops ? Explain all its types in detail with appropriate truth tables. 15

Unit IV

8. Draw a schematic diagram of the basic OP-AMP. Also, mention some of its applications. Explain the concept of virtual ground in a basic inverting amplifier. 15
9. Explain the block diagram representation of feedback configuration. Discuss the voltage series feedback amplifier effect of negative feedback on closed voltage gain with the definition of input-output resistance and bandwidth. 15