

2025

ELECTRONICS — MINOR

Paper : MN-2

(Operational Amplifier and Digital System)

Full Marks : 75

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Group - A

1. Answer **any ten** questions : 2×10
- (a) Explain the term CMRR in Op-Amps.
 - (b) Write down any two characteristics of an ideal OPAMP.
 - (c) Define input bias current in Op-Amp circuits.
 - (d) What is the difference between actual and virtual ground?
 - (e) Convert $(1101)_2$ to decimal and hexadecimal.
 - (f) Explain the operation of EX-NOR gate.
 - (g) What do you mean by positive and negative logic?
 - (h) Why is Op-Amp generally not used in open loop mode?
 - (i) What is the difference between a MUX and a decoder?
 - (j) What is propagation delay in a logic gate?
 - (k) What is Noise Margin?
 - (l) What is the difference between an ideal and a practical Op-Amp?

Group - B

2. Answer **any three** questions : 5×3
- (a) Draw the circuit diagram of an inverting amplifier using Op-Amp and derive the expression for Output voltage.
 - (b) Using NAND gates only, design a 4 : 1 MUX and give the truth table of the MUX.
 - (c) Explain the operation of weighted resistor D-A converter.
 - (d) Explain race problem in S-R flip-flop. How it can be solved?
 - (e) Briefly discuss Ring Counter and also give the output waveforms of the counter.

Please Turn Over

(3140)

Group - C

Answer *any four* questions.

3. (a) State and prove De Morgan's theorem.
 (b) Subtract by 2's complement method 10011 from 11101.
 (c) Write the difference between ASCII and EBCDIC alphanumeric codes. 4+4+2
4. (a) Simplify the Boolean function using K-map :

$$F(A, B, C, D) = \sum (0, 1, 2, 5, 8, 9, 10, 12, 15)$$

 (b) Convert Binary 110101 to Decimal and Octal.
 (c) Implement a full adder circuit using two half adders. 4+2+4
5. (a) What do you mean by offset voltage and offset current of an Op-Amp?
 (b) Explain Op-Amp as a differential amplifier.
 (c) Calculate the output voltage of a non-inverting amplifier using Op-Amp with input voltage $V = 2V$ and $R_f = 100K\Omega$ and $R_i = 500\Omega$. (2+2)+4+2
6. (a) Simplify the Boolean function :

$$F = \bar{A}BC + A\bar{B}C + ABC + AB\bar{C}$$

 (b) What are the advantages of Master-Slave flip-flop over J-K flip-flop?
 (c) Verify the Boolean identity :

$$A + \bar{B}C = (A + \bar{B})(A + C)$$

 (d) What is fan-in? 3+3+3+1
7. (a) Design a 4 : 16 decoder by using two 3 : 8 decoders and give the truth table.
 (b) Design a two input XNOR gate using NOR gates only.
 (c) Convert $(10001110101)_2$ to Gray Code. 4+3+3
8. Write short notes on (*any two*) : 5×2
 (a) Schmitt Trigger
 (b) Full-Subtractor
 (c) Code converter
 (d) 4-bit PISO register.