

2026

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.***1. Answer *any ten* questions :** 2×10

- (a) What is the hexadecimal equivalent of $(101011.111)_2$?
- (b) Verify the Boolean identity : $A(A + B) = A$.
- (c) Convert $(1111.1011)_2$ into octal number system.
- (d) Find the 2's complement of the number $(100110)_2$.
- (e) What is the binary equivalent of $(19.33)_{10}$?
- (f) Compare decoder and demultiplexer.
- (g) How many T-flip flops are required to design a Mod 64 ripple counter?
- (h) What are the basic characteristics of an ideal OPAMP?
- (i) What is slew rate of an OPAMP?
- (j) What is virtual ground?
- (k) What is output offset voltage?
- (l) What are closed loop gain and open loop gain of OPAMP circuit?

2. Answer *any three* questions :

- (a) Implement AND, OR, NOT, XOR and XNOR gates using minimum numbers of NAND gates. 5
- (b) Design a unity gain buffer circuit using OPAMP. Explain the application of the circuit. 3+2
- (c) Explain the working of a 4:1 multiplexer with the help of a truth table and circuit diagram. 5
- (d) Derive the expression for closed loop gain of an inverting amplifier using OPAMP. 5
- (e) Write down the truth table of a full adder. Design a full adder circuit using two half adders and a basic gate. 2+3

Please Turn Over**(7494)**

3. Answer **any four** questions :

- (a) (i) What are SOP and POS forms of a Boolean function? Explain with suitable examples.
 (ii) Simplify the Boolean function using K-map : $F(A, B, C, D) = \sum m(0, 1, 2, 5, 8, 9, 10, 12, 15)$.
 (2+3)+5
- (b) (i) Draw a two input noninverting summing amplifier circuit using OPAMP and determine the expression for output voltage.
 (ii) Derive the output voltage equation of an OPAMP integrator with the help of circuit diagram.
 (2+3)+(3+2)
- (c) (i) Derive the expression for output voltage of a differential amplifier using OPAMP with suitable circuit diagram.
 (ii) An OPAMP is configured as an inverting amplifier with $R_{in} = 10 \text{ k}\Omega$ and $R_f = 100 \text{ k}\Omega$. If the input voltage is $V_{in} = 0.5 \text{ V}$, determine the output voltage V_{out} .
 (iii) Why OPAMP is called differential amplifier? 5+3+2
- (d) (i) Find the complement of the Boolean function : $F = AB + A'B'$.
 (ii) Write down the truth table of a full substructure.
 (iii) Implement full substructure circuit using minimum number of NAND gates only.
 (iv) Implement NAND gate using NOR gates. 2+2+4+2
- (e) (i) Design a (4×16) decoder using two (3×8) decoders.
 (ii) Design an octal to binary decoder using basic gates.
 (iii) Implement a full adder circuit using suitable decoder and basic gates. 4+3+3
- (f) (i) Implement AND, OR and NOT gates using suitable MUX.
 (ii) Design an 8:1 multiplexer circuit using two 4:1 multiplexer and one 2:1 multiplexer.
 (iii) Realize the Boolean function $F = \sum m(0, 3, 5, 7)$ using 4:1 MUX. 4+3+3
- (g) (i) What are the advantages of JK flip flop over SR flip flop?
 (ii) What is race around condition?
 (iii) Draw the circuit diagram of a MOD-8 ripple counter using JK flip flops.
 (iv) What is T flip flop? 2+2+4+2