

2026

ELECTRONICS — MDC**Paper : CC-2****(Operational Amplifier and Digital Systems)****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.*Answer **question no. 1** and **any three** questions from **Unit-I** and **any four** questions from **Unit-II**.1. Answer **any ten** questions :

2×10

- (a) Define the slew rate of an OP-AMP.
- (b) What is CMRR of an OP-AMP?
- (c) What is meant by input offset current of an OP-AMP?
- (d) Find the 2's complement of the binary number $(110101)_2$.
- (e) What is decoder?
- (f) Write the advantages of Gray code over binary code.
- (g) Write down the advantages of R-2R DAC over binary weighted register method.
- (h) State any two characteristics of a practical operational amplifier.
- (i) Convert $(3A)_{16}$ to its binary equivalent.
- (j) What is an Excess-3 code?
- (k) State De Morgan's theorems.
- (l) What is meant by a universal logic gate? Name two universal gates.

Unit - I

- 2. Explain the operation of an OP-AMP integrator with a suitable circuit diagram and obtain the expression for its output voltage. 2+3
- 3. Define the following parameters of logic families — 2+3
 - (i) Fan in (ii) Fan-out (iii) Figure of Merit.
- 4. Write down the boolean expressions and the truth table of a two input EX-OR gate. Draw the circuit diagram of a two input EX-OR gate using NAND gates only. 2+3

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5. Design a 1 bit comparater circuit with the help of Truth Table. 2+3
6. Write the truth table of S-R flip-flop and draw the circuit diagram of it using logic gates. 2+3

Unit - II

7. (a) What are meant by virtual ground?
 (b) What are the characteristics of an ideal OP-AMP?
 (c) With the circuit diagram, derive the close-loop voltage gain of an inverting amplifier using OP-AMP. 2+3+(2+3)
8. (a) Convert the following :
 (i) $(47.25)_{10} = (?)_2$ (ii) $(635.2)_8 = (?)_2$ and (iii) $(E9C.8)_{16} = (?)_2$.
 (b) Perform the following operation- $(100101)_2$ is added with $(101100)_2$.
 (c) Subtract $11001 - 10010$ using 1's complement method. (2+2+2)+2+2
9. (a) Explain the difference between SOP and POS representations of a boolean function.
 (b) Simplify the following using 4-variable Karnaugh map :
 $f(A, B, C, D) = m(1, 2, 3, 5, 7, 9, 11, 13, 15)$
 (c) Implement the simplified function using NAND gates. 2+4+4
10. (a) Write down the truth table of 4×1 MUX and design using NAND gates
 (b) Write down the truth table of a full subtractor and implemet it using 4×1 MUX. (2+3)+(2+3)
11. (a) What is sequential circuit? Give example.
 (b) What are the differences between latch and flip-flop?
 (c) What is race around condition? How can be it eliminated?
 (d) What is an excitation table? Write the excitation table for D flip-flop. 2+2+3+3
12. (a) What is a counter?
 (b) Draw the circuit diagram and explain in brief the operation of a 3-bit Ripple counter.
 (c) What is Shift register? What are the different configurations of shift register? 2+(2+3)+(1+2)