

2025

**ELECTRONICS — MDC**

**Paper : MN-2**

**(Operational Amplifiers 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.*

1. Answer **any ten** questions : 2×10
- (a) What do you mean by Slew rate?
  - (b) What do you mean by input bias current in an Op-Amp?
  - (c) Draw the pin configuration of IC741.
  - (d) What is meant by 'Fan-out' in digital logic families?
  - (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) Find out decimal equivalent of  $(10101.111)_2$ .
  - (i) What is the use of select line in multiplexer?
  - (j) Define Asynchronous counter.
  - (k) Differentiate between asynchronous and synchronous counters.
  - (l) What is virtual ground?
2. Answer **any three** questions :
- (a) Explain the operational amplifier as non-inverting amplifier with necessary diagram. 4+1
  - (b) Write down the truth table and logic symbol of XOR gate. Implement XOR gate using minimum no. of universal gate. Write down the output expression of XOR gate. 1+1+2+1
  - (c) Write down characteristics table and transition table of JK F/F and draw the circuit diagram using NAND gates only. 2+2+1
  - (d) (i) Find 2's complement of the number  $(110111.10101)_2$ .  
(ii) Find the compliment of the function  $F = A(\overline{BC} + BC)$ . 2+3
  - (e) Explain the operation of R-2R ladder D – A converter. 5

**Please Turn Over**

**(3004)**

Answer *any four* questions.

3. (a) Simplify the Boolean function using K-map  $F(A, B, C, D) = \Sigma(0, 1, 2, 5, 8, 9, 10)$ .  
 (b) Why NAND and NOR gate are called universal gate?  
 (c) Implement a Full adder circuit using universal gate. 4+2+4
4. (a) Draw and explain the circuit of a 4-bit SISO shift register.  
 (b) Draw and explain the operation of MOD-8 counter with its timing diagram. 5+5
5. Write short notes on (*any two*) : 5×2  
 (a) Multiplexer  
 (b) Full-Subtractor  
 (c) Synchronous counter  
 (d) Encoder and priority encoder.
6. Convert the following as instructed : 2×5  
 (a)  $(17.60)_{10} \rightarrow (?)_2$   
 (b)  $(10111.10101)_2 \rightarrow (?)_8$   
 (c)  $(FA.5)_{16} \rightarrow (?)_2$   
 (d)  $(165)_{10} \rightarrow (?)_{BCD}$   
 (e)  $(10110)_2 \rightarrow (??)_{16}$ .
7. (a) What is an Operational Amplifier?  
 (b) What do you mean by offset voltage and offset current?  
 (c) What is unity gain buffer? Give the circuit diagram using Op-Amp. Where is it used? 2+(2+2)+(1+2+1)
8. (a) What are the ideal characteristic and practical limitations of Op-Amps?  
 (b) With circuit diagram, explain the working of a summing amplifier using Op-Amp. 5+5