

(3 Hours)

[Total Marks: 80]

- N.B.:- (1) Question No. **One** is compulsory.
(2) **Attempt** any **Three** questions out of remaining **five** questions.
(3) Assume suitable data wherever necessary.

Q 1. Answer any **Five** of the following :

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|--------|--|----|
| a. | State important characteristic of IC 741 and compare their value with those of an ideal op-amp. | 4 |
| b. | Show how op-amp can be used to give output $V_o = (V_1 + V_2 + V_3)/3$ | 4 |
| c. | Draw and explain the output waveforms of a differentiator for step and square input. | 4 |
| d. | Convert SR flip-flop to T flip-flop. | 4 |
| e. | Define: i> Propagation delay ii> Noise Margin | 4 |
| f. | Convert i> Convert gray to binary (101011) ii> $(11101101110.1001101)_2$ to hexadecimal equivalent. | 4 |
| Q 2 a) | What is instrumentation amplifier? State its advantages. State its applications and explain any one application in details. | 10 |
| Q 2 b) | Draw and explain the operation of first order high pass filter. Derive expression for voltage gain and explain its frequency response. | 10 |
| Q 3 a) | Draw schematic diagram of IC 555 as astable multivibrator. An IC 555 is configured to run in astable mode with $R_A = 4 \text{ k}\Omega$ $R_B = 4 \text{ k}\Omega$ and $C = 0.01 \mu\text{F}$. Determine the frequency of the output and duty cycle. Also draw the waveform for output voltage and voltage across capacitor. | 10 |
| Q 3 b) | i> Explain op-amp as zero crossing detector. ii> Compare Schmitt trigger with comparator. | 10 |
| Q 4 a) | List the various methods of A/D conversion. Explain successive approximation type ADC with neat diagram. | 10 |
| Q 4 b) | Design a 3 bit synchronous up-counter using T flip-flop. | 10 |
| Q5 | Solve | |
| Q 5 a) | Prove : $(X + XY)(X + \bar{X}Y)(X + Z) = X$ | 5 |
| Q 5 b) | Write short note on full adder. | 5 |
| Q5 c) | Implement Ex-OR gate using NAND gates. | 5 |
| Q5 d) | Implement the following Boolean expression using 8 : 1 multiplexer $f(A, B, C, D) = \Sigma m (2,4,5,7,10,14)$ | 5 |
| Q 6 a) | Minimize the function using K map and realize using logic gates. $f(A, B, C, D) = \Sigma m(1,4,8,12,13,15) + d(3,14)$ | 10 |
| Q 6 b) | i> Write a note on parity generators. | 10 |
| Q6 b) | ii> Compare between CMOS and TTL logic families. | |