(3 Hours) **[Total Marks :- 80]**

Instructions: 1. Question No. 1 is compulsory
2. Attempt any **three** questions out of remaining **five** questions
3. Figures to the right indicates marks
4. Assumptions made should be clearly stated

Q.1 Attempt **any five** from following

(a) Define input offset voltage and input offset current for an op-amp. State their ideal and practical values. [4]

(b) Illustrate operation of op-amp as a voltage follower. [4]

(c) Draw block diagram of op-amp and explain its operation. [4]

(d) Prove universality of *NAND* gate for *NOT* gate and *AND* gate. [4]

(e) Convert: (i) $(1085)_{10}$ to octal (ii) $(AB86.43)_{16}$ to decimal [4]

(f) Convert JK flip flop to T flip flop. [4]

Q.2. (a) With circuit diagram, explain the operation of op-amp as Schmitt trigger and draw its input and output waveforms. [10]

(b) Illustrate the operation IC 555 as astable multivibrator using functional block diagram and derive the expression for frequency and duty cycle. [10]

Q.3. (a) Design and implement full adder using 8:1 and 4:1 multiplexer. [10]

(b) Illustrate operation of op-amp as V to I and I to V converter. [10]

Q.4. (a) Explain first order low pass filter using op-amp with its frequency response. [10]

(b) (i) Simplify the following Boolean expression and implement using basic gates [05]

$$ABC + \overline{AB} + AB\overline{C} + AC + \overline{\overline{AB}}$$

ii) Write a short note on TTL and CMOS logic families. [05]

Q..5.(a) Minimize the expression using K-map & implement it using NAND gate [10]
$f=\sum m(2,3,6,7,8,9,12,13)+d(0,1,10,11)$

(b) Design and implement mod-8 ripple down counter using JK flip flops. [10]

Q..6 (a) Illustrate operation of op-amp as optical isolation amplifier. [10]

(b) (i) What are adjustable voltage regulators? [05]

ii) Explain ring counter. [05]

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