

Duration: 3 Hours

[Max Marks:80]

- N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
- a Explain the concept of virtual ground & virtual short in Op-Amp IC 741.
 - b Derive expression of voltage gain for Inverting amplifier
 - c State and explain Miller's theorem.
 - d Explain Barkhausen's criterion for sustained oscillations.
 - e Draw IC 555 timer based monostable multivibrator.
- 2 a Draw small signal equivalent circuit of dual input balanced output MOSFET differential amplifier. Derive the expression for A_d (Differential mode gain), A_{cm} (Common mode gain), CMRR. [10]
- b Draw block diagram of OPAMP and explain its characteristics. State its ideal and practical value for 741 IC. [10]
- 3 a Draw the circuit diagram of basic MOSFET differential amplifier and explain its operation. Sketch and explain its DC transfer characteristics. [10]
- b Describe the general frequency response of an amplifier and define the low, mid and high frequency ranges. Define low cut off and high cut off frequency for the amplifier. [10]
- 4 a Draw the circuit diagram of differentiator using OPAMP and derive the expression of output voltage. State its applications. [10]
- b Draw the circuit diagram of current to voltage converter and explain its operation. [10]
- 5 a Draw the circuit diagram and explain the operation of zero crossing detector. [10]
- b For IC 555 timer based astable multivibrator systematically derive all the relevant mathematical expressions for on time period (TON), off time period (TOFF), total time period(T), frequency(f_o) & duty cycle(D) [10]

6 a For the n channel MOSFET amplifier determine--- [10]

i) g_m ii) Unity gain bandwidth, fT

Given: - $K_n = 0.25$ milliampere/square volts, $V_{TN} = 1V$, $c_{gd} = 0.04$ pf, $c_{gs} = 0.2$ pf, $V_{GS} = 3$ volts. Is unity gain bandwidth parameter being dependent on amplifier circuit component values?

b Draw neat circuit diagram and explain the operation of astable multivibrator using IC [10]

555.List specifications of IC555.
