

B.Sc. Sem.-5 Examination

CC-301

Electronics

March-2025

Time : 2-30 Hours]

[Max. Marks : 70

Instructions: (1) Symbols used here have their usual meanings.
(2) Figures to the right indicate marks.

- Q-1 (i) Draw the schematic block diagram of an Op-Amp. Explain each block in detail. (7)
(ii) Draw normalized transfer characteristics for the differential pair and derive equations for i_{C1} and i_{C2} in the form of I_Q . (7)
- OR
- Q-1 (i) Mention any two circuits for improving CMRR. Explain any one briefly. (7)
(ii) In the basic differential amplifier circuit, $R_C = 2 \text{ k}\Omega$; $R_E = 4.3 \text{ k}\Omega$, $V_{CC} = |V_{EE}| = 5 \text{ V}$; $\beta_0 = 200$, $V_{BE} = 0.7 \text{ V}$. Determine the values of quiescent currents and voltages I_{BQ} , I_{CQ} , V_{O1} , V_{O2} , V_{CEQ} for both inputs V_1 and V_2 grounded. (7)
- Q-2 (i) What is current mirror circuit? Explain its working in brief. (7)
(ii) Write a short-note on peak detector using Op-Amp. (7)
- OR
- Q-2 (i) Draw the circuit diagram of current to voltage converter using Op-Amp. Explain its operation in detail. (7)
(ii) Write short note: positive clipper circuit using Op-Amp. (7)
- Q-3 (i) Write a note on: Series pass transistor (7)
(ii) Explain working of 3-terminal positive voltage regulator circuit. (7)
- OR
- Q-3 (i) Design an adjustable voltage regulator using a 3-terminal regulator for the following specification. Calculate S , R_o and total variation of output voltage. (1) Input voltage: $24 \pm 5 \text{ V DC}$ (2) Output voltage: 6 to 15V DC. (3) Output current: 0.1 to 1.0A (7)
(ii) Write a note on: IC 723 (7)
- Q-4 (i) For a buck-type switching regulator, draw the waveform of switching voltage, inductor voltage, capacitor voltage and derive the equation for ripple voltage. (7)
(ii) Explain any one circuit scheme for switching regulator. (7)
- OR
- Q-4 (i) Explain the operation of free running switching regulator. (7)
(ii) Draw a circuit of positive switching regulator using IC LM105. Explain briefly how regulation is achieved with decreasing load. (7)
- Q-5 Attempt any seven out of twelve. (14)
- (1) In ideal differential amplifier, if same signal is given to both inputs, then output will be _____.
- (2) If $A_{dm} = 4500$ and $A_{cm} = 0.45$, the CMRR is _____ dB.
- (3) The open loop gain of an ideal op-amp is _____.
- (4) A _____ circuit has a unity voltage gain.
- (5) A voltage to current converter is used for _____ voltage DC and AC voltmeter.
- (6) Peak detectors find application in _____.
- (7) Which type of diode is used for reference regulation protection in IC voltage regulators?
- (8) How many terminals does a 7800 series IC regulator have?
- (9) _____ is an example of 3-terminal positive IC voltage regulator.
- (10) A _____ Regulator can convert input direct current (DC) voltage to the desired direct current (DC) voltage.
- (11) What do you mean by filter inductance?
- (12) Mention any one application of IC LM 105.