

NE-121
November-2018
B.Sc., Sem.-V
CC-301 : Electronics

Time : 2:30 Hours]

[Max. Marks : 70

- Instructions :** (1) All questions carry equal marks.
 (2) Symbols have their usual meaning.

1. (a) Answer the following :

(i) Derive the equations of differential mode gain, common mode gain and CMRR for emitter coupled differential amplifier with the help of its low frequency small signal equivalent circuit. 7

(ii) For the basic emitter coupled differential amplifier circuit, $R_C = 2 \text{ k}\Omega$, $R_E = 4.3 \text{ k}\Omega$, $V_{CC} = V_{EE} = 5 \text{ V}$, $\beta_o = 200$ and $V_{BE} = 0.7 \text{ V}$.

Determine :

(I) I_{BQ} , I_{CQ} , V_{01} , V_{02} , V_{CEQ} for $V_1 = V_2 = 0$, and(II) ADM, ACM and CMRR 7**OR**(i) Explain the method of increasing the input resistance of an OP-AMP. 7(ii) Explain the importance of Active load in differential amplifier circuit. 7(b) Answer in short for four questions out of six : 4

(1) How is emitter biased in differential amplifier ?

(2) Define common mode signal.

(3) How can one improve CMRR ?

(4) Why the name current mirror circuit is given ?

(5) What is a V_{BE} multiplier ?

(6) What is the main function of the output stage in an OP-AMP ?

2. (a) Answer the following :

- (i) Draw the circuit diagram to perform addition and subtraction simultaneously with a single OP-AMP and obtain the formula for output. 7
- (ii) Explain the function of voltage to current converter circuit if the load is :
- (i) floating and
 - (ii) grounded

OR

- (i) Discuss the following applications of an OP-AMP with neat circuit diagram.
- (I) AC voltage follower
 - (II) Peak detector 7
- (ii) Discuss the operation of full wave precision rectifier circuit using OP-AMP with necessary waveforms. 7

(b) Answer in short for four questions out of six : 4

- (1) Give application of current to voltage converter.
- (2) What is a precision diode ?
- (3) Show, with the help of circuit diagram an OP-AMP as phase shifter.
- (4) List the important features of an instrumentation amplifier.
- (5) If an AC amplifier using OP-AMP, if $R = 1 \text{ k}\Omega$, and $C = 0.1 \text{ }\mu\text{F}$. then calculate lower cut-off frequency of an amplifier.
- (6) In current to voltage converter, how can high frequency noise be reduced ?

3. (a) Answer the following :

(i) Explain the operation of high current fixed voltage regulator with short circuit protection. 7

(ii) Discuss three terminal adjustable voltage regulator and obtain expression for stabilization factor and output resistance. 7

OR

(i) Explain fold back current limiting circuit of positive voltage regulator. 7

(ii) Discuss four terminal adjustable regulator. 7

(b) Answer, in short for **three** questions out of five : 3

(1) State the output advantages of IC voltage regulator.

(2) Define load regulation.

(3) What do you mean by tracking regulator ?

(4) What is band gap reference level ?

(5) What are the limitations of three terminal voltage regulator ?

4. (a) Answer the following :

(i) Draw and explain different schemes of switching regulators and their advantages. 7

(ii) Explain input and output power for switching regulator and prove that

$$I_1 = \left(\frac{t_{on}}{T} \right) I_0$$

OR

(i) Explain operation of switching regulator using LM 105. 7

(ii) State important characteristics and explain the operation of free running switching regulator with the help of circuit diagram. 7

(b) Answer in short for **three** questions out of five questions :

3

- (1) How is output voltage controlled in switching regulator ?
 - (2) Write the two limitations switching regulators.
 - (3) What is the function of pass-transistor in switching regulator ?
 - (4) Why is free wheel diode used in switching regulators ?
 - (5) What is ESR ?
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