Seat No. : 3994

NB-107

December-2015

B.Sc., Sem.-V

Core Course-301 : Electronics

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) All questions carry equal marks.

(2) Symbols used have their usual meanings.

(3) Numbers on right hand side indicate the marks.

1. (a) For low frequency small signal, derive equation of A_{DM} using hybrid Π model and A_{CM} and also derive equation of CMRR. 7

OR

(i) Discuss the Widlar current source. Derive the equation of I_{ref}. 4

(ii) Design a Widlar current source for generating a constant current $Io = 10\ \mu A$.

Take $V_{CC} = 10$ V, $V_{BE} = 0.7$ V, $\beta = 125$, $V_T = 25$ mV, $I_{ref} = 1$ mA 3

(b) For the basic emitter coupled differential amplifier circuit $Rc = 2\ K\Omega$, $Re = 4.3\ K\Omega$, $V_{cc} = V_{ee} = 5V$, $\beta o = 200$ and $V_{BE} = 0.7$ V. 7

(i) For $V_1 = V_2 = 0$, determine I_{BQ}, I_{CQ}, V_{o1}, V_{o2}, V_{CEQ}

(ii) Determine ADM, ACM and CM.

OR

Draw an analog computer circuit to solve the following equation 7

$x + 2y = 5$

$2x - y = 8$

Indicate where the voltmeters should be connected to read the solution and show what they are.

2. (a) Draw the circuit diagram of Adder and Subtractor using OPAMP for four input signal and shows $V_o = (V_3 + V_4) - (V_1 + V_2)$ 7

OR

Calculate output voltage for above circuit

Take $R_1 = 40\ K\ \Omega$, $R_2 = 25\ K\Omega$, $R_3, = 10\ K\Omega$, $R_4, = 20\ K\Omega$, $R_F = 50\ K\Omega$ and input voltages, $V_1 = 2$ V, $V_2 = 3$ V. Draw $V_3 = 4$ V, $V_4 = 5$ V.

(b) Discuss basic instrumentation amplifier. Derive the equation of output voltage for instrumentation amplifier using three OPAMP. 7

OR

Discuss the precision half-wave and full-wave rectifier using OPAMP.

3. (a) Draw and explain block diagram of fixed voltage regulator. 7

OR

Explain fold back current limiting of positive regulator using μA 723.

(b) Draw and explain block diagram of IC series regulator. 7

OR

Draw the circuit diagram of open loop current regulator and explain.

4. (a) Draw the circuit diagram of the basic switching buck regulator and prove that $\Delta Vc = V_1 D_r(1-D_r)/8LCf^2$. 7

OR

Derive the equation of critical inductance for buck regulator.

(b) Explain input and output power for switching regulator and prove that $I_1 = (t_{on}/T)I_o$ 7

OR

Draw and explain basic scheme of switching regulator.

5. Each question carry one mark. 14

(1) Draw only the internal block diagram of OPAMP.

(2) Give characteristic of ideal OPAMP.

(3) Define CMRR of OPAMP.

(4) For a given OPAMP, if $I_{CQ} = 100$ μA, find approximate value of trancoductance g_m.

(5) In AC amplifier using OPAMP, if R = 1 KΩ, C= 0.1 μF, calculate lower cut off frequency.

(6) In voltage to current convertor, does load current depends on load resistor ?

(7) In above question if R = 1 KΩ, V_i = 1.5 V, calculate load current

(8) In current to voltage convertor, how the high frequency noise can be reduced ?

(9) Define line regulation.

(10) Define load regulation.

(11) Define temperature coefficient.

(12) Write the function of invertor.

(13) Draw the block diagram of second scheme for switching regulators.

(14) Why freewheel diode is used in switching regulator ?
