13/05/16 S.E. (SEM-IV) CBSGS

EXTC - AE-II

156

Q.P. Code : 545702

(3 Hours) | Total Marks : 80

N.B.: (1) Question **No.1** is **compulsory**.
(2) Solve **Any Three** questions from remaining **Five** questions.
(3) **Figures** to the **right** indicate **full marks**.
(4) Assume suitable **data** if **necessary** and mention the **same** in the **answer sheet**.

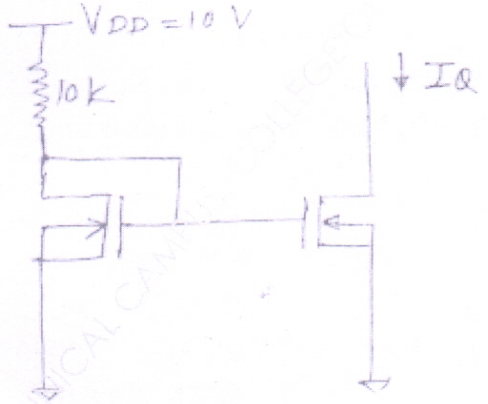
1. Solve **any Five** : **20**

(a) Define CMRR. Derive the expression for CMRR of a BJT differential amplifier.

(b) Draw the circuit diagram of an inverting amplifier using Op-Amp and derive expression for its voltage gain.

(c) Differentiate between small signal BJT and power BJT.

(d) For the circuit shown below find IQ.



For both MOSFETs $V_{TN} = 1V$, $K_n = 100\ \mu A/V^2$.

(e) Explain working of Integrator using Op-Amp.

(f) For differential amplifier with $A_d = 100$ and $A_c = 0.1$. If two sets of inputs are applied as given below.

(i) $V_1 = 100\mu V$, $V_2 = 80\mu V$

(ii) $V_1 = 200\mu V$, $V_2 = 160\mu V$

Determine output voltage in each case.

TURN OVER

2. (a) Determine the corner frequency and maximum gain of the MOSFET amplifier shown in figure. **10**

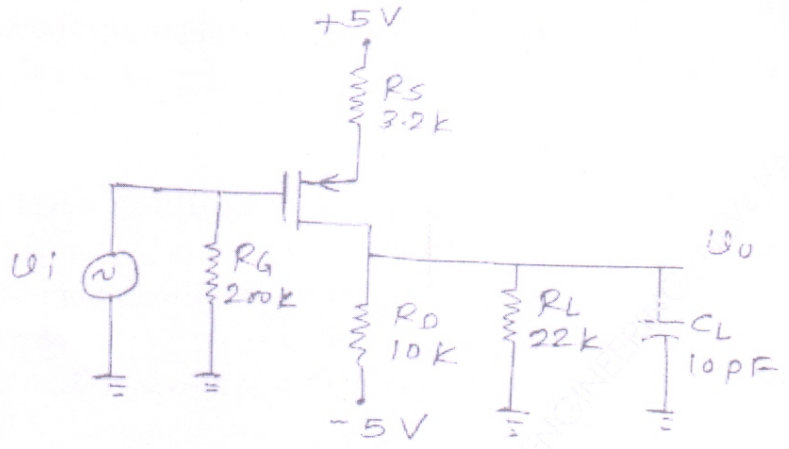


Fig. 2a

The transistor parameters are V_{TP} = -2V, K_p = 0.25 mA/V^2 and $\lambda = 0$.

(b) For the circuit in Fig. 2b, Find midband gain and corner frequencies. **10**

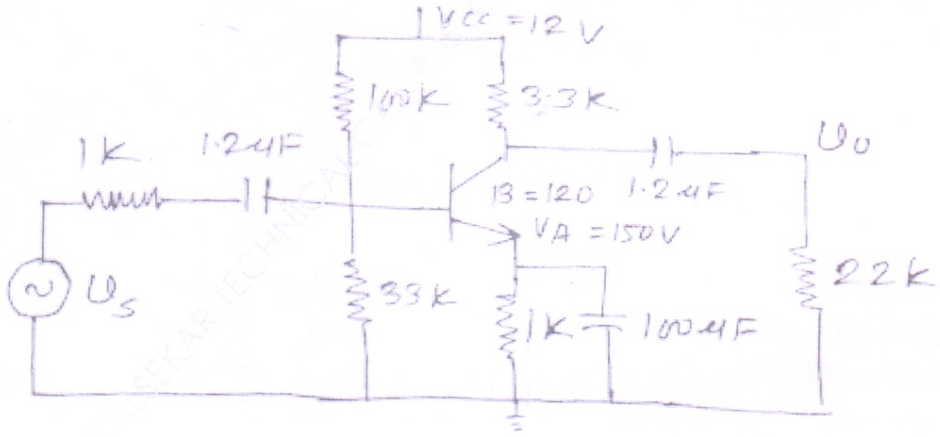


Fig. 2b

3. (a) The cascode circuit shown in Fig. 3a has parameters $V^+ = 12V$, $V^- = 0V$, $R_1 = 58.8k\Omega$, $R_2 = 33.3k\Omega$, $R_3 = 7.92k\Omega$, $R_C = 7.5k\Omega$, $R_S = 1k\Omega$, $R_E = 0.5k\Omega$ and $R_L = 2k\Omega$. The transistor parameters are $\beta = 100$, $V_{BE} = 0.7V$, $VA = \infty$, $C\pi = 24pf$ and $Cu = 3pf$. **10**

(i) Determine upper 3dB frequencies corresponding to the input and output portions of the equivalent circuit.

(ii) Calculate small signal midband voltage gain.

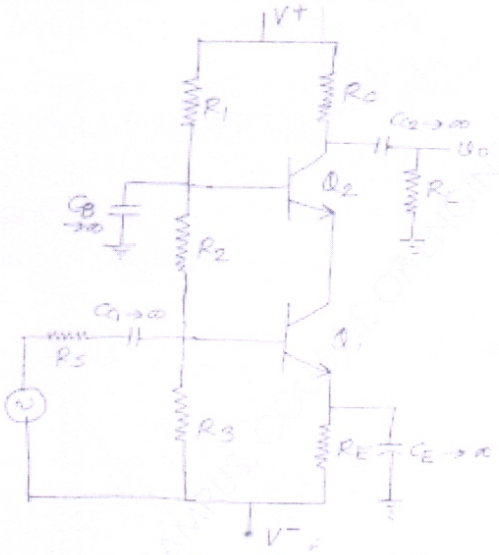
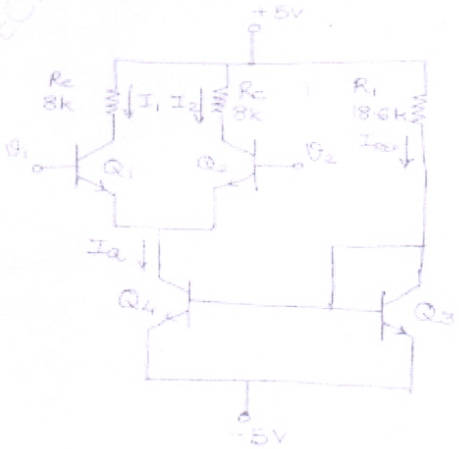


Fig. 3a

(b) Determine the differential and common-mode input resistances of a differential amplifier shown in figure below : **10**



The transistor parameters are $V_{BE(ON)} = 0.7V$, $\beta = 100$ and $V_A = 100V$.

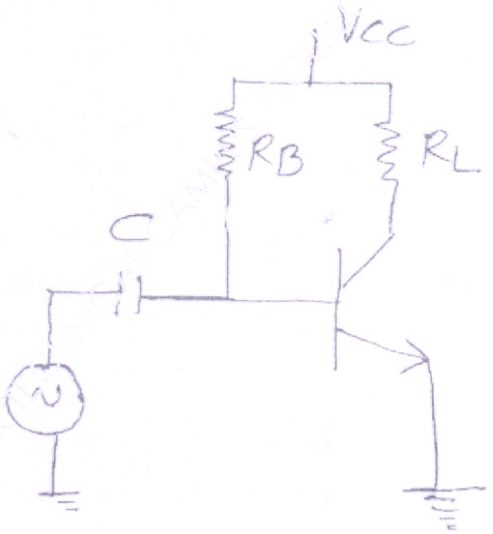
TURN OVER

4. (a) Draw a neat circuit diagram and explain working of the improved 3 transistor (MOSFET) current source. Derive the relationship between the output current and reference current. **10**

(b) Draw the circuit diagram for an inverting summing amplifier using operational amplifier. Derive the relationship for its output voltage V_0 for four inputs V_1, V_2, V_3 and V_4. **10**

5. (a) Explain Class - B operation of power amplifiers. What is crossover distortion? How is it eliminated. **10**

(b) For the circuit shown in fig. 5b, the transistor parameters are $\beta = 100$, $P_{DMAX} = 2.5$ W, $V_{CEMAX} = 25V$, $I_{CMAX} = 500mA$. If $R_L = 100\Omega$ then find Vcc and R_B to deliver maximum power to the load. With the obtained values of Vcc and R_B calculate the maximum undistorted ac power that can be delivered to R_L. **10**



6. Write short notes on **any Four** : **20**

(a) Zener Shunt Regulator
(b) Power MOSFET
(c) Active Filters
(d) Multistage Amplifiers
(e) Millers Theorem.