Printed Pages : 7

NEC402

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 131406

Roll No.

B.Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15

ELECTRONIC CIRCUITS

Time : **3** Hours] [Total Marks : **100**

Note: (1) Attempt all questions.

(2) All questions carry equal marks.

1 Attempt **any four** parts of the following:- **5×4=20**

(a) Draw the circuit diagram of difference amplifier using OP-AMP and calculate the differential gain (A_d) and differential input resistance(R_{id}).

(b) For the circuit in Fig.(1) calculate the values of v_1, i_1,i_2,v_0, i_L and i_o. Also calculate the voltage gain, current gain and power gain.

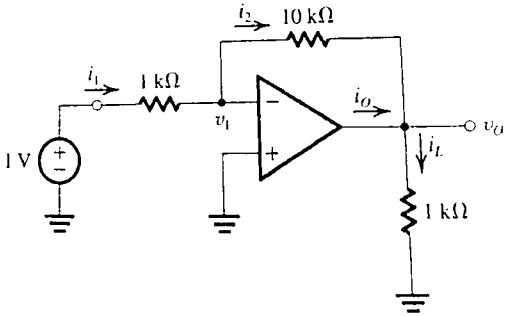

Fig.(1)

(c) Explain how the performance of an OP-AMP is affected by the open loop gain of an amplifier.

(d) Explain the effect of finite open loop gain and bandwidth on the circuit performance. And calculate the frequency response of closed loop inverting amplifier.

(e) An inverting amplifier with nominal gain of -20V/V employs an op-amp having a dc gain of 10^4 and a unity gain frequency of 10^6Hz. What is the 3-dB frequency f_{3dB} of the closed loop amplifier? What is the gain at 0.1 f_{3dB} and at $10f_{3dB}$.

(f) (i) Describe the terms Unity- gain Bandwidth and Full-power Bandwidth.

(ii) For an op-amp having a slew rate of 60 V/μs, what is the highest frequency at which a 20-V peak to peak sine wave can be produced at the output.

2 Attempt **any four** parts of the following:- **5×4=20)**

(a) Derive the i_d-V_{ds} relationship for NMOS working in saturation region.

(b) Explain the need of biasing. Also explain the merits and demerits of the various biasing techniques used in MOSFET.

(c) Consider the FET amplifier of Fig.(2) for the case V_t=2V, kn'(W/L)=1mA/V^2, V_{GS}=4V, V_{DD}= 10V and R_D=3.6KΩ.

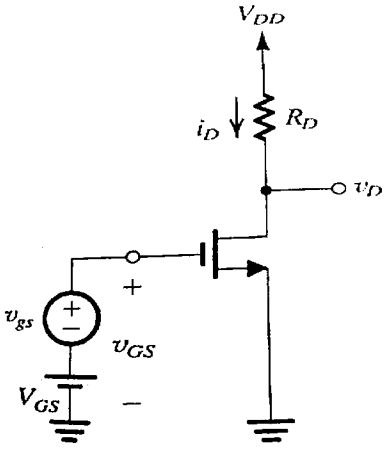

Fig.(2)

(i) Find the dc quantities I_D and V_D.

(ii) Calculate the value of gm at the bias point.

(iii) Calculate the value of voltage gain.

(iv) If the MOSFET has $\lambda = 0.001V^{-1}$, find r_o at the bias point and calculate the voltage gain.

(d) Calculate the MOSFET Unity –Gain Frequency (F_T) with the help of MOSFET high frequency model.

(e) In the circuit of Fig.(3) let $R_G = 10M\Omega$, $R_D = 10K\Omega$, and $V_{DD} = 10V$. Find the value of V_D and V_G for V_t=1V and kn' (W/L)=0.5m A/V^2.

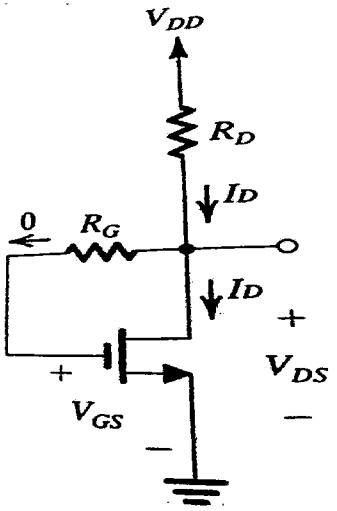

Fig. (3)

(f) Calculate the overall gain $G_V = V_o/V_{sig}$, input resistance and output resistance for a Common Source Amplifier.

3 Attempt **any two** parts of the following: **10×2=20**

(a) Explain the working of BJT as an amplifier and as a switch with the help of neat diagram and necessary equations. Also calculate the amplifier gain.

(b) Calculate the voltage gain for the circuit given in Fig.(4). Assume $\beta = 100$.

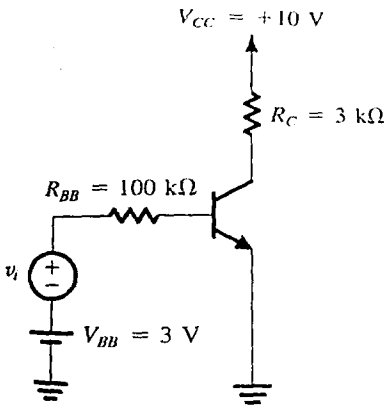

Fig.(4)

(c) Explain the effect of each capacitor of a CE amplifier with the gain frequency curve. Also discuss the low frequency response of a CE amplifier.

4 Attempt **any two** parts of the following:- **10×2=20**

(a) (i) What are the advantages of double ended differential amplifier over single ended differential amplifier.

(ii) Explain the operation of MOS differential pair with differential input voltage. Also calculate the range of input differential signals.

(b) (i) Calculate the effect of gm mismatch on CMRR for MOS differential pair.

(ii) Calculate the input offset voltage of MOS differential pair when there is a mismatch in threshold voltage V_t.

(c) Calculate the CMRR for the Bipolar Differential pair with Active Load.

5 Attempt **any two** parts of the following:- **10×2=20**

(a) Explain the merits and demerits of negative feedback. Also explain in brief the various topologies used in negative feedback.

(b) Derive the expression for the loop gain and frequency of oscillation for Collpit's oscillator.

(c) Explain the Bark-Hausen criteria for sustained oscillations. Also explain the working of crystal oscillator.
