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328453(28)

B. E. (Fourth Semester) Examination, ~~2020~~ APR-MAY 2022

(New Scheme)

(ET & T Engg.)

ANALOG ELECTRONICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *In each question part (a) is compulsory and carry 2 marks. Solve any two parts from (b), (c) & (d) and carry 7 marks. Assume suitable data if required.*

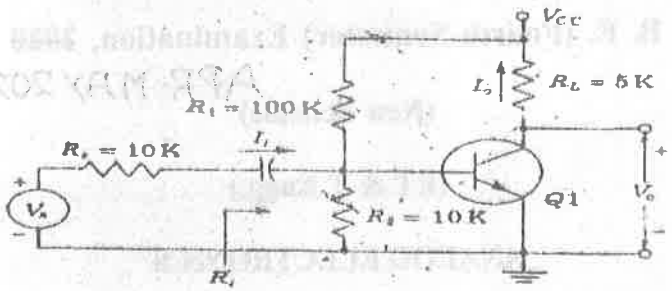
Unit-I

1. (a) State Miller's Theorem.

   (b) Find h_{fe} in terms of the CB h-parameters.

   (c) The transistor amplifier shown below uses a transistor

whose h-parameters are given as $h_{ie} = 1{\cdot}1$ k, $h_{fe} = 50$, $h_{re} = 2{\cdot}5 \times 10^{-4}$ and $h_{oe} = 25\ \mu A/V$. Calculate $A_I = Io/I_i$, A_v, A_{vs}, R_0 and R_i.



(d) What is Darlington pair? Derive expression for input resistance and current gain for Darlington pair.

Unit-II

2. (a) Discuss the effect of temperature on the base spreading resistance.

(b) For hybrid-π model derive expression for :

(i) conductance $g_{b'e}$

(ii) feedback conductance $g_{b'c}$

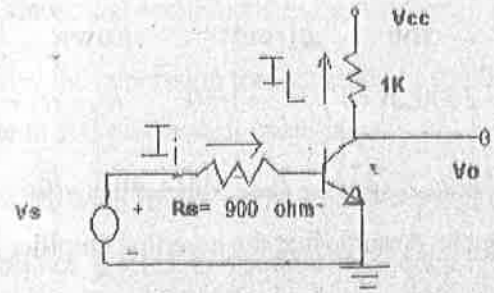
(iii) base spreadin resistance $r_{bb'}$

(iv) output conductance g_{ce}.

in terms of h-parameters.

(c) At $I_c = 1$mA and $V_{CE} = 10$ V, a certain transistor data shown $C_c = 3$pF, $h_{fe} = 200$ and $\omega_T = 500M$ rad/sec M rad/sec. Calcuate $g_m, r_{b'e}, C_e$ and ω_β.

(d) For hybrid-π parameter of transistor used in the circuit shown below are $g_m = 50$m A/V, $r_{b'e} = 1\text{k}\Omega$, $r_{b'c} = 4\text{M}\Omega$, $r_{ce} = 80\text{k}\Omega$, $C_e = 100$pF and $r_{bb'} = 100\Omega$. Find (i) Upper 3 dB frequency of current gain $A_i = I_i/I_i$ (ii) The value of voltage gain $A_{vs} = V_0/V_s$ at frequency of part (i).



Unit-III

3. (a) Write the types of distortions in an amplifier.

   (b) Obtain an expression for the second harmonic distortion D_2 in terms if G_1, G_2 and I_{bm}. Where $i_c = G_1 i_b + G_2 ib^2$ and $i_b = I_{bm} \cos \omega t$

   (c) How push-pull arrangement of an amplifier reduees harmonie distortion? Explain by drawing a ckt of class A push pull amplifier.

   (d) Define rise time of an amplifier, and how it is related with upper 3-dB frequency of the amplifer?

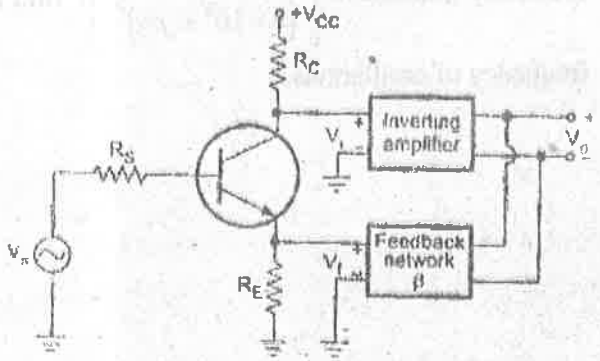
Unit-IV

4. (a) What are the affects of topology on input and output resistance?

   (b) Derive the expression for input and output resistances in case of voltage shunt topology.

   (c) For the circuit shown below, $A = -2000$, $\beta = V_f / V_0 = 1/50$, $R_s = R_L = R_E = R_c = 3k\Omega$, $h_{ie} = 2k\Omega$, $h_{ie} = 200$ and h_{re}, h_{oe} are negligible, Assume that the inverting amplfier input

resistance is infinte and that the feedback network can be respresented by an ideal controlled voltage source. Find (i) V_i as function of V_s and V_f (ii) $A_{vf} = V_0 / V_s = A\ V_i / V_s$.



   (d) Explain the effect of feedback on amplifier bandwidth and stability?

Unit-V

5. (a) Give the two Barkhausen conditions required in order for sinusoidal oscillations to be sustained?

   (b) Derive the expression for frequency of oscillation in case of RC phase shift osciallator?

   (c) What is Wein Bridge oscillator? Show that for such oscillator $\beta = 1/3$ at resonant frequency.

(d) The gain of a forward amplifier is frequency dependent and given by $A = \left[\frac{-1 \times 10^7}{jw} \right]$. If the feedback fraction is $\left[\frac{9 \times 10^3}{(6 \times 10^3 + jw)^2} \right]$, find the frequency of oscillations.