Code No: R09220402 **R09** **Set No. 2**

II B.Tech II Semester Examinations,April/May 2012
ELECTRONIC CIRCUIT ANALYSIS
Common to ICE, E.COMP.E, ETM, EIE, ECE

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive an expression for frequency of oscillation of a RC phase-shift oscillator using a FET.
   (b) In a Hartley oscillator $L_2 = 0.04$ mH and C = 0.004 μF . If the frequency of oscillation is 150 KHz, find L_1. Neglect mutual inductance. [8+7]

2. (a) What is push-pull configuration and how does this circuit reduce the harmonic distortion?
   (b) For a class B amplifier providing a 20V peak signal to a 16Ω load operates on a power supply of V_{cc} = 30V. Determine the input power, output power and circuit efficiency. [8+7]

3. (a) For the circuit shown in figure1, estimate A_i, A_v, R_i & R_o using resonable approximations. The h parameters for the transistor are given as $h_{fe} = 100$, $h_{ie} = 2k\Omega$, h_{re} is negligible & $h_{oe} = 10^{-5}$ mhos.

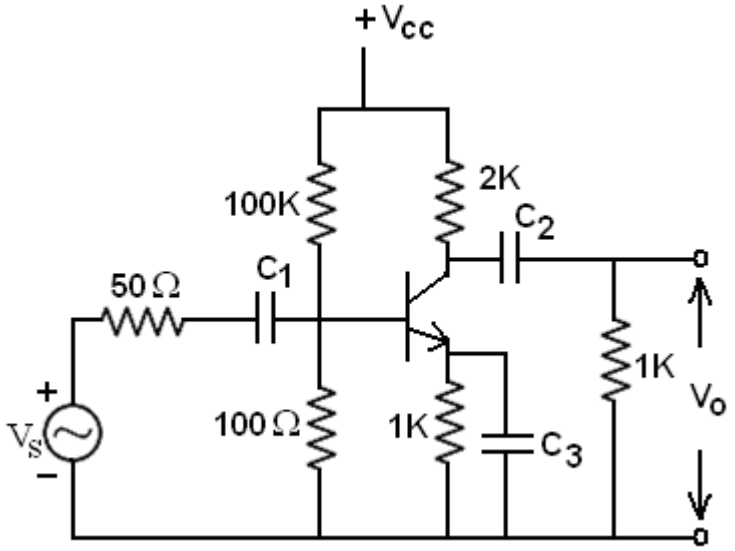

Figure 1:

   (b) Draw the ciruit diagram of Emitter follower and derive the equation for voltage & current gains. [8+7]

4. (a) Derive the equation for voltage gain of a Common Source FET amplifier.

(b) The amplifier shown in figure 2 uses an n - channel FET having I_{DSS} = 2mA, V_P = -2V. If the quiscent drain to ground voltage is 10V, find R_1 and the effective input impedance. [7+8]

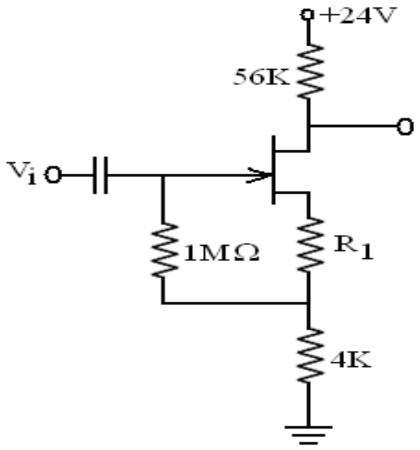

Figure 2:

5. (a) Draw the equivalent circuit of a double tuned amplifier and derive the expression for gain at resonance.
   (b) Derive the expression for effective bandwidth of cascaded tuned amplifier. [8+7]

6. (a) Derive an expression for the transfer gain of a feedback amplifier.
   (b) The feedback amplifier shown in figure 3 has transistor parameters h_{ie} = 1k h_{re} and h_{oe} negligible. Find $R_{mf} = V_o/I_s$, $A_{vf} = V_o/V_s$, R_{if} and R_{of}. [5+10]

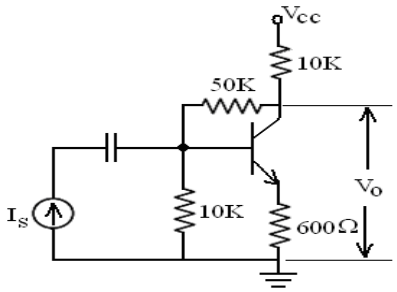

Figure 3:

7. (a) Prove that $h_{fe} = g_m r_{b'e}$
   (b) How does g_m vary with $|I_C|$, $|V_{CE}|$ &T?
   (c) Draw the small-signal high frequency CE model of a transistor. [5+5+5]

8. (a) How the bandwidth is effected in multistage amplifier?
   (b) What are the advantages of direct coupled amplifiers?

(c) What is the use of transformer coupling in the output stage of multi-stage amplifier?

[5+5+5]

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1. (a) Define f_β and f_T and also establish the relationship between f_β and f_T.
   (b) Derive the expression for the CE short -circuit current gain as a function of frequency. [7+8]

2. For the circuit shown in figure 4, show that
   (a) $(A_{VS})_{\max} = -\frac{h_f}{h_i h_o - h_r h_f}$ if $R_L = \infty$ & $R_S = 0$
   (b) $R_i = \frac{h_i h_o - h_r h_f}{h_o}$ if $R_L = \infty$ [8+7]

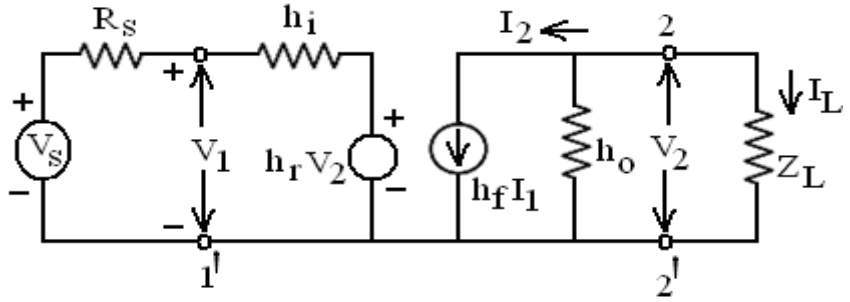

Figure 4:

3. (a) Sketch the circuit of a CS amplifier. Derive the expression for the voltage gain at low frequencies. What is the maximum value of voltage gain?
   (b) The FET shown in figure 5 has the following parameters:
   I_{DSS} = 5.6mA & V_P = -4V. If V_i = 10V find V_O. [8+7]

4. (a) Draw the equivalent circuit of a single tuned capacitive coupled ampifier and derive the expression for gain at resonance.
   (b) Draw the circuit diagram for tuned RF amplifier and explain its working. [7+8]

5. (a) Derive an expression for the output power of a class A large - signal amplifier in terms of V_{max}, V_{min} I_{max} & I_{min}.
   (b) For a particular power amplifier, the optimum load impedance is 180Ω. Calculate the turns ratio required to match an 8Ω load to this transistor. If the amplifier takes a mean collector current of 2A from a 15V supply and delivers an ac load power of 2.5W to the transformer coupled - load, calculate the efficiency and the collector dissipation(negleting the losses) [7+8]

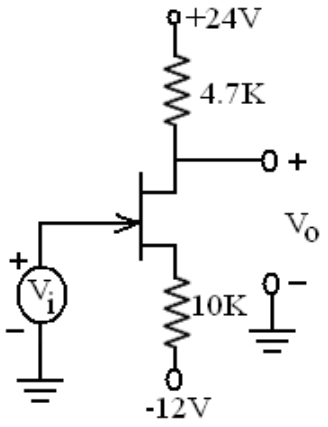

Figure 5:

6. (a) Discuss about the types of negative feedback amplifiers giving the effect of each type of feedback on the parameters of the amplifier.
   (b) What sort of feedback is employed in a CE amplifier with unbypassed emitter resistor? Discuss its analysis in detail. [7+8]

7. Design a RC phase-shift oscillator to operate at a frequency of 5KHz. use a MOSFET with $\mu = 55$ and $r_d = 5.5$K. The phase - shift network not load the amplifier.
   (a) Find the minimum value of the drain - circuit resistance for which the circuit will oscillate.
   (b) Choose reasonable values of R and find C. [8+7]

8. (a)Write the expressions for over all voltage gain (A_V^n), f_L^n *and* f_H^n when n-nonidentical amplifier stages are cascaded.
   (b) Compute f_H and f_L a 2-stage amplifier if f_{H_1} = 3KHz and f_{H_2} = 4KHz ; f_{L_1} = 300Hz and f_{L_2} = 600Hz. [15]

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Code No: R09220402 **R09** **Set No. 1**

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1. (a) Prove that the following two networks (a) & (b) shown in figure 6 have the same currents if excited by same voltages.

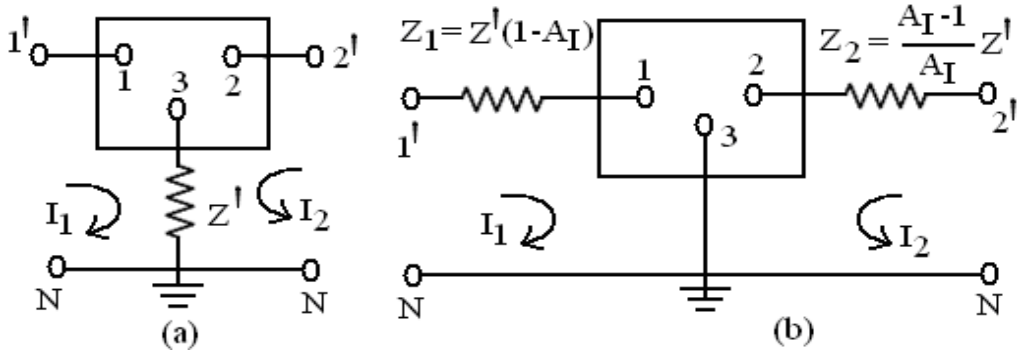

Figure 6:

(b) Draw the simplified hybrid model for the CC circuit and derive expressions for input Resistance, output resistance voltage gain and current gain. [7+8]

2. (a) Write the equation for overall gain of a n - stage cascaded Amplifier.

(b) How does the frequency response an amplifier change with cascading of amplifier stages?

(c) Explain the choice of configuration in a cascade of amplifiers. [5+5+5]

3. (a) Draw the frequency response of tapped single tuned capacitance couplped amplifier and derive the expression for L for maximum power transfer.

(b) Draw the circuit of double tuned amplifier and explain its working. [8+7]

4. (a) What is a class B amplifier? Where is it employed? Give its circuits, design equations, characteristics & limitations.

(b) A transformer coupled class A large signal amplifier has maximum and minimum values of collector to emitter voltage of 25V and 2.5V. Determine its collector efficiency. [10+5]

5. (a) What are the characteristics of an amplifier that are modified by negative feedback?

(b) Draw the four types of feedback amplifiers naming them.

(c) Define sensitivity & Desensitivity factors in feedback Amplifiers. [5+5+5]

6. (a) Derive an expression for voltage gain of a common source FET amplifier with and without source resistance included in the circuit.

   (b) Calculate the voltage gain of the FET amplifier shown in the figure 7, assuming blocking capacitor to be large g_m and r_d are given as, g_m = 4mA/V and r_d = 5K.[8+7]

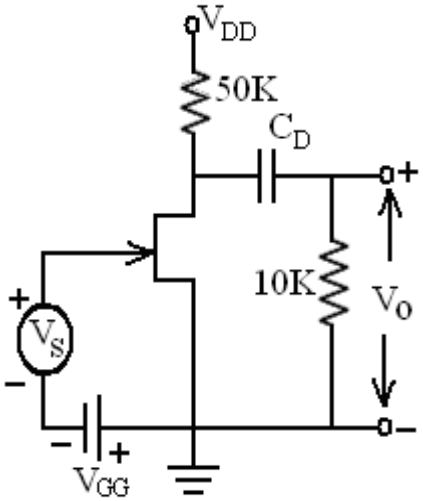

Figure 7:

7. (a) Explain why the upper 3-dB frequency for current gain is not the same as f_H for voltage gain.

   (b) A Silicon PNP transistor has an f_T = 400MHz. What is the base thickness?

   (c) In terms of what parameters is the high frequency response of a CE stage obtained? [5+5+5]

8. (a) Draw the electrical model of a piezoelectric crystal.

   (b) Sketch the reactance Vs frequency function.

   (c) Over what portion of the reactance curve do we desire oscillations to take place when the crystal is used as part of a sinusoidal oscillator? Explain. [4+4+7]

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1. (a) When n-identical stages of amplifier are cascaded. Derive the expression for lower and upper cutoff frequencies.
   (b) Explain the effect of coupling capacitor in a CE amplifier on low frequency response of amplifier. [8+7]

2. (a) A transistor supplies 0.8W to a 5K load. The zero signal dc collector current is 30mA, and the dc collector current with signal is 36mA. Determine the percent second - harmonic distortion.
   (b) Define conversion efficiency. Determine the maximum value of conversion efficiency for a series - fed class A power amplifier. [7+8]

3. (a) For the circuit shown in figure 8, compute A_I, A_V, A_{VS}, R_i and R'_o. The transistor h-parameters are h_{ie}=1.1K, h_{fe}=50, h_{re}=2.4× and h_{oe}=25μA/V.

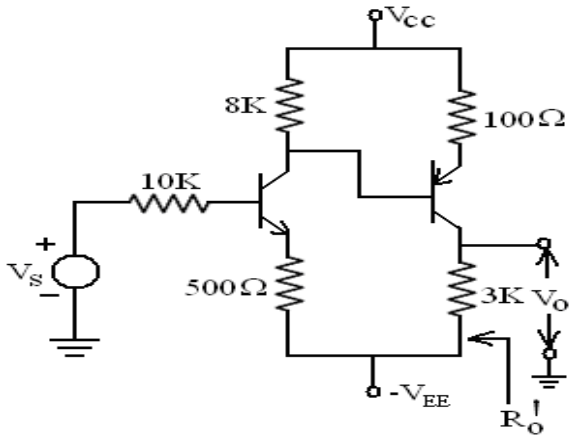

Figure 8:

   (b) Compare Direct Coupled Amplifiers with RC Coupled Amplifier. [10+5]

4. (a) Obtain CC 'h' parameters interms of CE parameters.
   (b) For a CE amplifier, calculate the voltage gain, input impedance, output impedance, current gain. If R_L = 10kΩ, h_{ie} = 1.1kΩ, h_{re} = 2.5×10^{-4}, h_{fe} = 50, h_{oe} = 24μA/V. [7+8]

5. (a) Why a FET cannot be explained with h-parameters?
   (b) Derive an expression for Trans - conductance using FET model.

(c) Draw and explain the FET high frequency model. [3+6+6]

6. (a) Sketch a circuit of a crystal - controlled oscillator and explain its function.
   (b) Explain the frequency - stability criterion for a sinusoidal oscillator. [8+7]

7. (a) Compare neutralisation and unilaterlisation methods of tuned amplifiers.
   (b) What are the limitations of stagger tuned amplifiers?
   (c) What happens when no. of stages is increased in single tuned cascaded amplifiers? [5+5+5]

8. (a) What is negative feedback? Discuss how it can improve stability in an amplifier.
   (b) Find A_{vf}, R_{if}, R_{of}, for the circuit shown in figure 9. R_s=0, h_{fe}=50, h_{ie}=1100Ω and h_{re} and h_{oe} are negligible. Assume Identical transistors. [5+10]

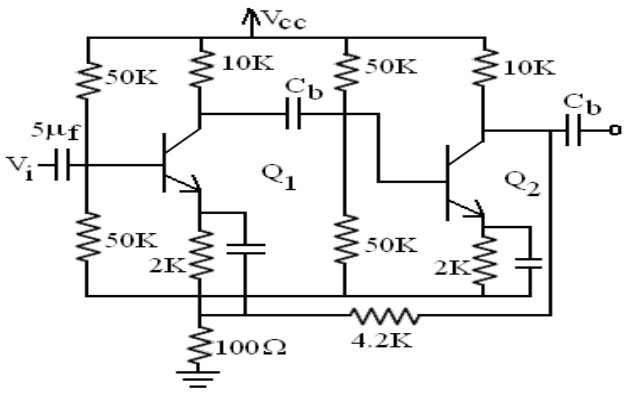

Figure 9:

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