Code: 9A02405

1

II B. Tech II Semester (R09) Regular & Supplementary Examinations, April/May 2012

ANALOG ELECTRONIC CIRCUITS

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 Derive the voltage gain, current gain , input resistance and output resistance of a single stage CC amplifier with source resistance RS and load resistance RL.

2 (a) Draw hybrid - π model for a transistor in the CE configuration and explain the significance of every component in this model.
(b) Given a germanium p-n-p transistor whose base width is 10^{-4} cm. At room temperature and for a dc emitter current of 2 mA, find: (i) emitter diffusion capacitance, (ii) F_T [Assume diffusion constant as 47 cm^2/sec].

3 (a) How many types of feedbacks in amplifiers, explain?
(b) A negative feedback of 0.0005 is applied to an amplifier whose open loop gain is 60 dB. If the open loop gain gets reduced by 12%, how much the overall gain gets altered.

4 (a) Write down the expression for frequency of oscillation in Hartley and Colpitts oscillators.
(b) In a Colpitts oscillator, C_1= 0.16 µF, L = 15.8 mH and its frequency of oscillation is 10 kHz, calculate the value of capacitor C_2.

5 (a) Derive the expression, with necessary diagrams, to calculate the total harmonic distortion 'D' in power amplifiers using the five-point method of analysis.
(b) State the expression relating the total output power 'P'; total harmonic distortion 'D' and the fundamental power 'P_1' in power amplifiers. If total distortion in the amplifier is 9%; calculate its contribution to the total power.
(c) Discuss the effect of the increase in the order of harmonic frequency in power amplifier stage used in an instrument for listening to music.

6 (a) What is synchronized clamping? Explain.
(b) Design a diode clamper circuit to clamp the positive peaks of the input signal at zero level. The frequency of the input signal is 500 Hz.

7 (a) Explain the behavior of a BJT as a switch in circuits. Give examples.
(b) Write a short note on switching times of a transistor.

8 (a) Explain the reason for the occurrence of overshoot at the base of normally ON transistor of one shot. Derive an expression for overshoot.
(b) Discuss a few applications of a monostable multivibrator. Explain how it differs with that of a binary.

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Answer any FIVE questions
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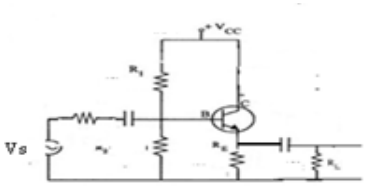
1 Draw hybrid - π model for a transistor in the CB configuration and explain the significance of every component in this model.

2 Draw the high frequency π model of a transistor and derive difference conductance's and gains.

3 (a) State the condition of (1 + $A\beta$) for which a feedback amplifier must satisfy in order to be stable.
(b) An emitter follower of Fighas the following values: R_s = 600 Ω, R_L = 1 kΩ, h_{fe} = 100 and h_{ie} = 1 kΩ. Calculate A_i, R_i, A_v, R_o and $R_{of.}$



4 (a) Derive the voltage gain in terms of its tuned components in Hartley oscillator.
(b) The resonant circuit of a tuned-collector transistor oscillator has a resonant frequency of 5 MHz. If value of capacitance is increased by 50%, calculate the new resonance frequency.

5 (a) Calculate the second harmonic distortion, if the output signal waveform of a push pull amplifier has measured values of V_{CEmin} = 1 V; V_{CEmax} = 24 Volts and V_{CEQ} = 14 V; using an oscilloscope.
(b) Explain harmonic distortion and crossover distortions in power amplifiers.

6 (a) Prove that an RC circuit behaves as a reasonably good integrator if RC>>15 T, where T is the period of an input E_m Sin ωt.
(b) What is the ratio of the rise time of the three sections in cascade to the rise time of a single section of low pass RC circuit?

7 (a) Explain the behaviour of a BJT as a switch. Give applications.
(b) Write a short note on switching times of a transistor.

8 (a) Explain how a Schmitt trigger circuit acts as a comparator.
(b) What do you understand by hysteresis? What is hysterisis voltage? Explain how hysterisis can be eliminated in a Schmitt trigger.

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Time: 3 hours Max Marks: 70

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1 (a) Discuss about different types of distortions that occur in amplifier circuits
(b) Three identical non interacting amplifier stages in cascade have an overall gain of 2 dB down at 50 Hz compared to mid band. Calculate the lower cutoff frequency of the individual stages.

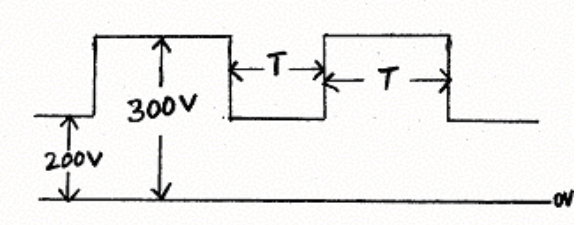
2 Derive the CE amplifier short circuit current gain and gain band width product using equivalent circuit and draw the variation of Ic with frequency.

3 Draw and explain voltage-series amplifier using h-parameter model, derive voltage gain, input resistance, output resistance and current gain closed loop and open loop.

4 Design a phase-shift oscillator to operate at a frequency of 6 kHz. Use JFET with $\mu = 60$ and $r_d = 5.5$ k. The phase shift network is not to load down the amplifier. Find the minimum value of the drain circuit resistance Rd for which and the circuit will oscillate, and find the product of RC.

5 (a) When are two transistors said to have complementary symmetry? Draw the circuit of complementary symmetry push pull class-B power amplifier and explain its operation together with characteristics of amplifier.
(b) Show that the even harmonics are eliminated in class-B push pull configuration.

6 The square wave shown is fed to an RC coupling network. What are the voltage waveforms across R and across C if:
(a) RC is very large, say RC = 10 T (b) RC is very small, say RC=T/10?



7 Write short notes on:
(a) Diode switching times (b) Switching characteristics of transistors (c) FET as a switch.

8 What is a monostable multivibrator? Explain with the help of a neat circuit diagram the principle of operation of a monostable multi, and derive an expression for pulse width. Draw the wave forms at collector and bases of both transistors.

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(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

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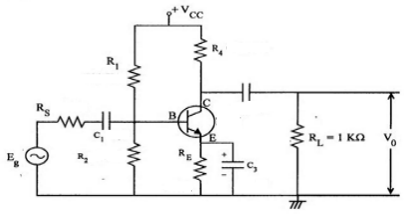
1 (a) What is meant by Miller 's theorem and applies this in CE amplifier with feedback from collector to base terminal, derive the voltage gain and input resistance?
(b) Find A_I, Ri, A_V, A_{VS} of CE amplifier with feedback resistance from collector to base is R_B = 200 k , R_C = 10 k, R_e =1 k and R_S = 10 k, using millers theorem. Assume, h_{fe} = 150, h_{ie} = 900 ohms, hoe = 25 µA/V.

2 (a) Discuss the effect of emitter bypass capacitor on low frequency response of BJT amplifiers.
(b) Calculate the coupling capacitor C_C required in Figure to provide a low frequency 3 dB point at 125 Hz if R_S = 600 Ω, h_{ie}= 1 kΩ, h_{fe}= 60, R_1 = 5 kΩ and R_2= 1.25 kΩ. For:
(a) an ideal bypass capacitor C_E, (b) a practical bypass capacitor with R_{CE} = 25 Ω.



3 Draw and explain current-series amplifier using h-parameter model, derive voltage gain, input resistance, output resistance and current gain closed loop and open loop.

4 (a) Define gain and phase margins.
(b) In the Hartley oscillator, L_2= 0.4 mH and C = 0.004 µF. If the frequency of the oscillator is 120 kHz, find the value of L_1. Neglect the mutual inductance.

5 (a) For harmonic distortions of D_2 = 0.1, D_3 = 0.02 and D_4 = 0.01 with fundamental component of output signal I_1 = 4 A and R_L = 8 Ω. Calculate the total harmonic distortion, fundamental power component and total power.
(b) A power transistor working in class A operation has zero signal power dissipation of 5 watts. If A.C. power is 2 watts, find collector efficiency and power rating of the transistor.

6 (a) Prove that for any periodic input waveform the average level of the steady state output signal from the RC high pass circuit is always zero.
(b) Prove the above statement for (different periodic input waveforms) square wave input.

7 Derive the expression for collector to emitter voltage with open circuited base and draw the circuit.

8 Describe multivibrators from the viewpoints of construction, principle of working, classification based on the output states, applications and specifications. Mention one specific application of each.

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