Code No: R22043 **R10** SET - 1

II B.Tech II Semester, Regular Examinations, April – 2012
ELECTRONIC CIRCUIT ANALYSIS
(Com. to ECE, EIE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Perform the small signal analysis of CS Amplifier and explain the characteristics with the help of relevant graphs.
   b) For the emitter follower with R_s = 1 K and R_L = 5 KΩ, determine the various characteristics parameters by assuming h-parameters as h_{fe} = 75, h_{ie} = 1.1K, h_{oe} = 25 μA/v. (7M+8M)

2. a) Enumerate the effects of negative feedback on the various characteristics of the amplifier.
   b) The open loop voltage gain of the amplifier of an amplifier is 50. Its input impedance is 1kΩ. What will be the input impedance where a negative feedback of 10% is applied to the amplifier? (8M+7M)

3. a) Draw the circuit of Hartley oscillator and explain its working. Derive the expressions for frequency of oscillation and condition for starting of oscillation.
   b) A crystal has the following parameters:
   L=0.33 H, Cs=0.0655 pF, Cp=1.0pF and R=5.5KΩ .
   Find the series resonant frequency and Q-factor of the crystal. (10M+5M)

4. a) Perform the analysis of two stage RC Coupled JFET-CS Amplifier circuit.
   b) Draw and explain the circuit diagram of a RC Coupled amplifier. Derive the expression for voltage gain of the amplifier. (7M+8M)

5. a) Derive the expressions for resistive parameters of Hybrid-π model in terms of low frequency h-parameters.
   b) Following measurements of a certain transistor are available at room temperature and with I_c = 5 mA, V_{CE}=10V, h_{fe} = 100, h_{ie} = 600Ω. $[A_{ie}]$ = 10 at 10MHz. C_c = 3pF. Calculate f_{β}, f_T, C_e, $r_{b'e}$ and $r_{bb'}$. (8M+7M)
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6. a) Show that class B push pull amplifiers exhibit half wave symmetry.

   b) A power transistor is to be used as a class A transformer coupled amplifier and is to deliver a maximum of 5W to a 4 ohm load. Operating point is adjusted for symmetrical clipping with collector supply voltage of 20V. Assume ideal characteristics with $V_{min} = 0$ V.

   Calculate.

   i) Transformer turns ratio.

   ii) Peak collector current

   iii) Operating point values of I_{CQ} and V_{CEQ}.

   iv) Power dissipation rating of transistor.

   v) Collector circuit efficiency. (7M+8M)

7. a) Draw the circuit diagram of a double-tuned amplifier and explain different stages of simplification of its equivalent circuit.

   b) A circuit is resonant at 455 kHz and has a 10 kHz bandwidth. The inductive reactance is 1255Ω. What is the parallel impedance of the circuit at resonance? (8M+7M)

8. a) Draw the circuit and explain how short circuit over load protection is provided in Voltage Regulators circuits.

   b) Design a zener-shunt regulator with the specifications using a zener diode with $V_z = 10$ V. Input supply voltage varies from 15V to 25V and the load current varies between 0 and 15 mA. Also determine the line and load regulation. (7M+8M)

Code No: R22043 **R10** SET - 2

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ELECTRONIC CIRCUIT ANALYSIS
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) With the help of necessary equations, discuss the variations of A_v, A_I, R_i, R_o, A_p with R_S and R_L in common Emitter configuration.
   b) For the emitter follower with R_s = 1 K and R_L = 5 KΩ calculate A_i, R_i, A_v, A_{vs} and R_o. Assume h_{fe} = 75, h_{ie} = 1.1K, h_{oe} = 25 μA/v (7M+8M)

2. a) What are the different types of negative feedback? Explain how the input and output impedances of an amplifier are affected by the different types of negative feedback.
   b) The open loop gain of an amplifier is 50Db. A negative feedback of feedback factor 0.004 is applied to it. If the open loop gain is thereby reduced by 10% find the change in the overall gain.
   c) How does negative feedback reduce distortion in an amplifier? (7M+5M+3M)

3. a) Derive the expression for the frequency of oscillation and the minimum gain required for sustained oscillations of the RC phase shift oscillator using BJT.
   b) Draw the equivalent circuit of a quartz crystal. What makes the quartz produce stable oscillations? (10M+5M)

4. a) Draw the circuit for Darlington pair amplifier and derive the expressions for A_I, Av, R_i and R_o.
   b) Three identical non-interacting amplifier stages are cascaded with an overall gain of 0.3dB down at 50 kHz compared to mid-band. Calculate the upper cutoff frequency of the individual stages. (8M+7M)
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5. a) Explain about Hybrid-π capacitances. How do Hybrid-π parameters vary with temperature?

b) The following low-frequency parameters are available for a transistor at

$I_{CQ} = 5$ mA

$h_{ie} = 1K$, $h_{fe} = 100$ $h_{oe} = 4 \times 10^{-5}$ A/V

$h_{re} = 10^{-4}$ $C_{ob} = 2$ pF $f_T = 10$ MHz

Compute the values of hybrid-π parameters at room temperature. (7M+8M)

6. a) Draw the circuit diagram of class-B push pull amplifier and explain the operation.

b) Explain Class D and Class S power amplifiers. Mention their salient features and applications. (8M+7M)

7. a) Draw the circuit diagram of a double-tuned amplifier and explain its working and derive the expression for I_2 max.

b) A single-tuned class A transformer-coupled RF amplifier has the following parameters:

Transconductance, g_m of the transistor = 5mA/V

Primary inductance = 100 μH

Secondary inductance = 50 μH

Coefficient of coupling = 0.01

Primary resistance = 10 Ω

Secondary resistance = 8 Ω

The primary is tuned with a 100 pF capacitor and the secondary is loaded by a 10KΩ resistance. Find:

The resonant frequency

The effective Q of the tuned circuit

The 3 dB bandwidth

Assume r_o of the transistor to be very large. (7M+8M)

8. a) Define the terms i) Load Regulation ii) Line Regulation iii) Ripple Rejection and iv) Temperature Stability pertaining to Voltage Regulator ICs.

b) 7824 regulator IC can deliver a maximum current of 700 mA. Design a circuit using same IC to deliver a current of 3.0 A. (8M+7M)

Code No: R22043 **R10** SET - 3

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ELECTRONIC CIRCUIT ANALYSIS
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Perform the small signal analysis of CD Amplifier and explain the characteristics with the help of relevant graphs.
   b) Consider a single stage CE amplifier with R_s = 1KΩ, R_e = 50 K, R_2 = 2K, R_c = 1K, R_L = 1.2K, h_{fe} = 50, h_{oe} = h_{re} = 0. h_{ie} = 1.1K. Find A_i, R_o, A_v and power gain using approximate analysis. (7M+8M)

2. a) Explain the general characteristics of negative feedback amplifiers.
   b) A single stage CE amplifier has a Voltage gain of 600 without feedback. When feedback is employed, its gain reduces to 50. Calculate the percentage of the output which is fed back to the input. (8M+7M)

3. a) Explain the working of Wien Bridge Oscillator using BJT. Also derive the expression for the frequency of Oscillation.
   b) The ac equivalent circuit of a Crystal has the Values: L=3 H, C_S=0.005pF, R= 2KΩ and C_m=10 pF. Determine the series and parallel resonant frequencies of the Crystal. (8M+7M)

4. a) Perform the analysis of Boot-Strapped emitter follower Circuit.
   b) Design a two-stage CE-CE amplifier for the given data. h_{fe1}=h_{fe2}=180, R_L=1KΩ I_{E1}=I_{E2}=1mA, S=3, V_{CC}=12V, f=100Hz. Assume identical transistors. (7M+8M)
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5. a) Draw the equivalent circuit of hybrid-π model and derive the expressions for Hybrid-π impedances in terms of low frequency h-parameters.

   b) The following low-frequency parameters are available for a transistor at

   I_C =10 mA, V_{CE}=10V and at room temperature

   h_{ie} = 500Ω h_{fe} = 100 h_{oe} = 10^{-5} A/V h_{re} = 10^{-4}

   At the same Operating point, f_T=50 MHz and C_{ob} = 3 pF

   Compute the values of all the hybrid-π parameters. (8M+7M)

6. a) Deduce the expression which gives the relationship between maximum collector dissipation and maximum power output of class-B push pull amplifier.

   b) Write short notes on Heat Sinks used in power amplifiers and also give the classification. (8M+7M)

7. a) Derive the expression for the gain of a single-tuned capacitance coupled amplifier. Discuss about its Selectivity.

   b) A parallel resonant circuit comprises of an inductor (having inductance of 1mH and resistance of 10Ω) and a parallel capacitor of 100 pF.

   Calculate:

   i) Resonant frequency, ignoring the resistance.

   ii) Resonant frequency, considering the resistance.

   iii) Q-factor.

   iv) Impedance at resonant frequency. (7M+8M)

8. a) Draw the circuit for series type voltage regulator and explain its working.

   b) A series regulator has stability factor of $6*10^{-3}$ and output resistance of 10^{-4} ohms. Calculate the change in output voltage when

   i) Unregulated input d.c voltage varies by 10V.

   ii) Load current varies by 250mA. (7M+8M)

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ELECTRONIC CIRCUIT ANALYSIS
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Perform the small signal analysis of CG Amplifier and explain the characteristics with the help of relevant graphs.
   b) Consider a single stage CE amplifier with R_s = 1KΩ, R_e = 50 K, R_2 = 2K, R_c = 1K, R_L = 1.2K, h_{fe} = 50, h_{oe} = h_{re} = 0. h_{ie} = 1.1K. Determine A_i, R_o, A_v and power gain using exact method of Analysis. (7M+8M)

2. a) Explain the concept of feedback and draw the topologies of various feedback amplifiers.
   b) Calculate the voltage gain, input impedance and output impedance of a voltage series feedback amplifier having an open-loop gain A=300, R_i=1.5KΩ, R_o=50KΩ and ß= -1/20. (7M+8M)

3. a) Perform the Generalized analysis of LC oscillators with suitable block diagram and Obtain the circuit diagrams of Hartley and Colpitt's oscillators.
   b) Design a RC phase-shift oscillator, which has the following specifications: h_{fe}=200, I_E=1.5mA, S=8, VCC=12V and oscillation frequency expected is 500Hz. (8M+7M)

4. a) Draw the circuit diagram of Cascode-transistor amplifier Circuit and analyze its performance.
   b) Draw the circuit diagram for differential amplifier and perform the analysis with its equivalent circuit. (8M+7M)

5. a) Explain the concept of CE short circuit current gain with the help of equivalent circuit.
   b) Following measurements of a certain transistor are available at room temperature and with I_c = 5 mA, h_{fe} = 100, h_{ie} = 0.62 KΩ. Short circuit current gain = A_{is} = 10 at 10MHz. C_{bc} = 3_{pF}. Calculate f_T and f_{β}. (7M+8M)
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6. a) Derive the expression for maximum value of conversion efficiency of Class A Power amplifier.

   b) Ideal class – B transformer-coupled audio amplifier is fed from 20 V DC. Transformer ratio is $\frac{N_p}{N_s} = 4$. A 4 ohm speaker is connected to load. Calculate:

   i) Maximum signal power delivered to load.

   ii) Power dissipation rating to each transistor.

   iii) Maximum excitation current at input if transfer characteristic is linear ($h_{fe} = 20$)

   (7M+8M)

7. a) Draw the circuit diagram of double-tuned amplifier and simplify the same with its equivalent circuit.

   b) Draw the circuit for single tuned capacitive coupled amplifier and explain its working. Derive the expression for (A/A_{reso}) . (7M+8M)

8. a) Define different performance parameters of a voltage regulator and explain their importance.

   b) Design a voltage regulator using IC 723 to provide an output voltage of 5 volts at 1.5A. Fold back current limiting is to be provided so that knee current is 1.6A, short circuit current is 300mA and input voltage is 13 volts. (7M+8M)