Code.No: 07A51002 | R07 | SET-1

III B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
ELECTRONIC CIRCUIT ANALYSIS
(ELECTRONICS & INSTRUMENTATION ENGINEERING)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

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1.a) For the emitter follower circuit as shown in figure 1, calculate the quiescent voltage and current for V_{CC}=20Volts, h_{fc} = 1.1KΩ, h_{oc} = 2.5 x 10^{-6} mhos and h_{rc} is negligibly small. Reactance of capacitance need not be considered at the frequencies of interest. If R_1 = 27Ω, R_2 = 5.6KΩ, R_L= R_E =220Ω, R_s = 0Ω, Find the maximum undistorted peak-to-peak output voltage.

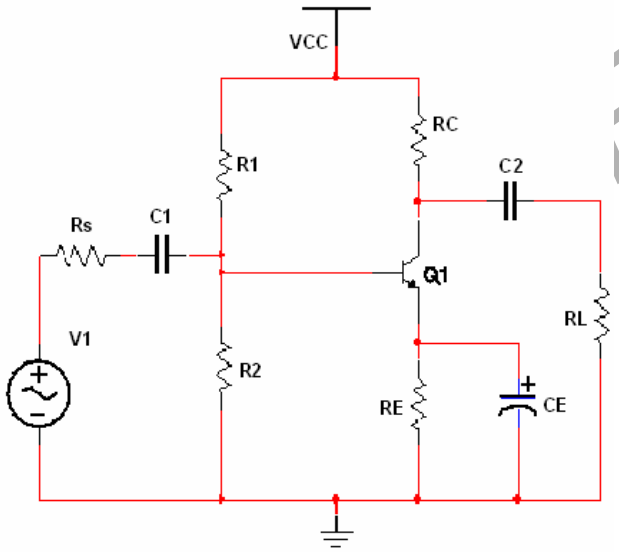

Figure 1

b) Compare and contrast Common Emitter, Common Collector and Common Base amplifiers in all aspects. [8+8]

2. Write short notes on the following:
a) Two-Stage RC coupled Amplifier
b) Darlington Pair. [8+8]

3.a) Draw the hybrid Π equivalent circuit of CE amplifier? Reason out whether it is same for CB or CC configurations.

b) Derive the expressions for inter-electrode capacitances in terms of the low frequency parameters and properties of the transistor? [8+8]

4. State the merits of using push pull configuration. Describe the operation of class B push pull amplifier and show how even harmonics are eliminated. [16]

5. Draw the circuit for single tuned capacitive coupled amplifier and explain its working. Discuss about its stability. [16]

6. A BJT has a maximum power dissipation P_{Dmax} of 2W at an ambient temperature of 35^0C and maximum junction temperature $T_j=150^0$C. Compute
   a) The thermal resistance of the transistor
   b) Maximum power that can be dissipated at an ambient temperature of 50^0C.
   c) The junction temperature for dissipating 1W at 25^0C. [16]

7.a) Discuss the factors on which DC output voltage of a regulator depends.
   b) Determine the series current limiting resistor of a zener diode shunt regulator that delivers 12mA current in to a load to maintain 12Volts output. The input voltage to the regulator can vary between 18 Volts to 24 Volts, The minimum current required to operate the zener diode in breakdown region is 3mA. Assume ideal zener diode with zero resistance. [8+8]

8. Write short notes on the following:
   a) Three terminal IC voltage regulator.
   b) DC-DC converters. [8+8]

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ELECTRONIC CIRCUIT ANALYSIS
(ELECTRONICS & INSTRUMENTATION ENGINEERING)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
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1.a) For the Common Collector amplifier circuit as shown in figure 1 using a silicon transistor of β = 100 and R_s = 0 Ω, determine the voltage gain, current gain, input & output impedances.

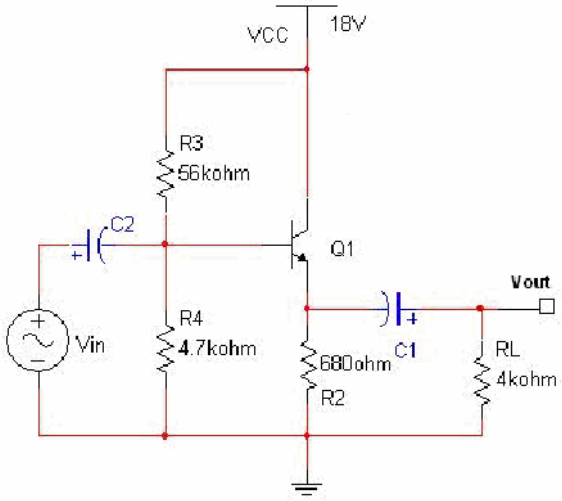

figure 1

b) Repeat computation of voltage gain and output impedance if the internal resistance of the source is 1K Ω. [8+8]

2.a) For a two-stage CE-CC amplifier cascade, derive expressions for AV , AI , AVS and RI , assuming identical transistor characteristics.

b) List the features of a Cascode amplifier. [8+8]

3. The following frequency parameters are known for a given transistor at I_c = 15mA, V_{CE} = 10V, h_{ie} = 500 Ω, h_{re} = 10^{-4}, h_{fe} = 90, h_{oe} = $4x10^{-5}$ A/V. At the same operating point f_T = 50MHz and C_{ob} = 3pF. Calculate the values of all the hybrid ∏ parameters. [16]

4. Design a transformer coupled CE amplifier to drive an 8Ω load if V_{cc} = 20V, V_{BE} = 0.7 V. β =100, R_{in} = 2K Ω, and the transformer ratio of 10:1 determine the current gain power output, and the maximum undistorted voltage output swing. [16]

5. A parallel resonant circuit uses a coil of inductance 1.5mH and resistance 8Ω in one branch and a capacitor of 120pF in the other branch. Determine
   a) Resonant frequency
   b) Impedance of the circuit at resonance
   c) The quality factor Q of the coil.
   d) Bandwidth
   e) Line current at resonance if supply votage is 10V,
   f) Resonant frequency neglecting resistance of the coil. Also Comment on the results. [16]

6. A transistor has a maximum dissipation rating of 10W at ambient temperatures up to 40^0C and is de-rated at 10mW/^{0}C at higher temperatures. At what ambient temperature is the dissipation rating one half its low temperature value. [16]

7.a) What is the requirement for current limiting in voltage regulators.
   b) Draw the transistor based shunt voltage regulator and describe its functioning. Justify the statement that current limiting is an inherent feature of shunt voltage regulators.
   c) How can shunt regulators be differentiated from series voltage regulators? [5+5+6]

8a) Describe circuit Configurations with LM317 IC 3-terminal voltage regulator for adjustable positive and negative output voltages.
   b) Connect a 78XX and a 79XX three-terminal IC voltage regulators to obtain a regulated dual power supply. [8+8]

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ELECTRONIC CIRCUIT ANALYSIS
(ELECTRONICS & INSTRUMENTATION ENGINEERING)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

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1.a) For the common emitter amplifier circuit as shown in figure 1 Compute the values of A_{VS}, A_{IS}, R_{IN} and R_{OUT}, if the components of the circuit are : $R_1 = 100K\Omega$, $R_2 = 27K\Omega$, $R_C = 3.9K\Omega$, $R_E = 1.0K\Omega$, $R_L = 10K\Omega$, $R_s = 100\Omega$. Reactance of C_1, C_2 and C_E is negligible at the input frequencies.

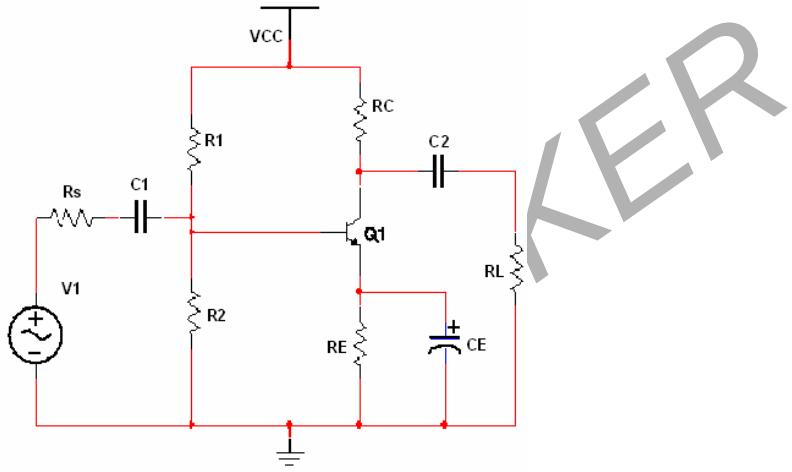

figure 1

b) What are the conditions on the circuit elements of a common emitter amplifier to obtain maximum undistorted peak-to-peak output for a small signal input? [8+8]

2.a) What is non-linear distortion? Discuss the causes for this type of distortion in amplifiers.

b) For the two-stage RC coupled amplifier circuit shown in figure 2 calculates the Individual stage voltage gains and the overall voltage gain. Input impedance of individual stages is given as 2.4 KΩ and β of individual transistors as 80. [8+8]

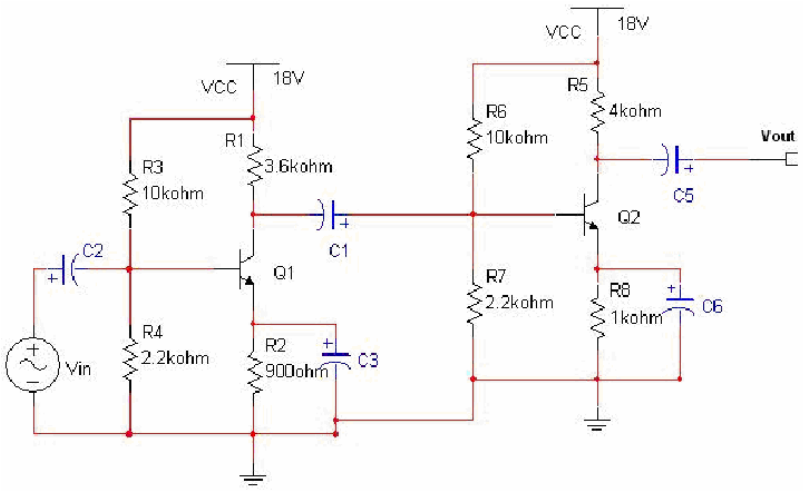

figure 2

3.a) Give the typical values of various hybrid $\prod$ parameters.

b) Define upper and lower cutoff frequencies for an amplifier? A BJT has following parameters I_c = 2.6mA, f_T = 500MHz, $rb'e = 1K\,\Omega$, $rbb' = 100$, $C_c = 3pF$. Find the values of gm, $C_{b'e}$ and β for the BJT. [8+8]

4. A single stage class A amplifier $V_{cc} = 20V, V_{CEQ} = 10V, I_{CQ} = 600mA, R_L = 16\Omega$.

The ac output current varies by 300mA with the ac input signal. Find

a) The power supplied by the dc source to the amplifier circuit.
b) ac power consumed by the load resistor.
c) ac power developed across the load resistor.
d) dc power delivered to the transistor
e) dc power wasted in transistor collector.
f) Overall efficiency
g) Collector efficiency.

5. Draw the equivalent circuit of a single tuned capacitively coupled CE amplifier.

a) List all the assumptions and approximations to convert the equivalent circuit into a simplified form.
b) List the merits and demerits of capacitive coupling in tuned amplifiers in comparison with transformer coupling.

6. A transistor with a maximum junction temperature specification of 150^0C dissipates a maximum power of 40W at a case temperature of 25^0C and 2W at an ambient temperature of 25^0C. Find

a) The maximum power dissipation capability when operated safely at a free space temperature of 50^0C.
b) Maximum power dissipated at 50^0C, with a heat sink for which $\theta_{sa} = 4^0\,C/W$.

[8+8]

7. Write short notes on the following:

a) Transistor series voltage regulator
b) Zener diode shunt voltage regulator. [8+8]

8.a) Describe the functioning of a Voltage Multiplier with the help of a generalized multiplier circuit diagram.

b) Discuss about the possible trade-offs between efficiency, noise performance and operating frequency of a switching voltage regulator. [8+8]

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III B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
ELECTRONIC CIRCUIT ANALYSIS
(ELECTRONICS & INSTRUMENTATION ENGINEERING)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

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1.a) Discuss the effect of each and every component of a CE amplifier that has an influence on the frequency response of the amplifier.
b) Draw the circuit diagram and equivalent circuit of a Common Source amplifier. Derive expressions for A_V,A_I,R_{IN} and R_{OUT} without source and load resistances. [8+8]

2.a) With the help of suitable circuit diagram and equivalent circuit show that the input impedance & overall voltage gain of a Darlington pair is much larger compared to an individual CE amplifier with same transistor.
b) Reason out the causes and results of Phase & Frequency distortions in transistor amplifiers. [8+8]

3. A single stage CE amplifier is designed to have a voltage gain bandwidth f_H of 5MHz with $R_L = 500\,\Omega$. Assume $h_{fe} = 100$, gm = 100mA/V, $r_{bb'} = 100\,\Omega$, C_c = 1pF and f_T = 400MHz.
a) Find the value of the source resistance that will give the required bandwidth.
b) With the value of R_s found in part a, find the mid band voltage gain (use approximate analysis). [8+8]

4. Design a complementary symmetry diode compensated circuit which requires 4V (zero to peak) output in to an $8\,\Omega$ load. Take V_{cc} = 15V and the transistor has $\beta = 100$. Design the circuit so that the diodes remain on during the entire cycle of the input signal. [16]

5.a) Define load regulation and specify the ideal value of load regulation.
b) The specifications of two regulated power supplies with an input voltage range of 20 V to 28 V are listed below:
Regulated Power Supply1:
Rated output voltage: 18V
Output voltage at 20 V input: 18V
Output voltage at 28 V input: 18.82V
Regulated Power Supply2:
Rated output voltage: 15V
Output voltage at 20 V input: 15.2V
Output voltage at 28 V input: 15.67V
Determine which power supply has superior specifications. Justify your answer.
c) List the merits and demerits of shunt voltage regulators. [5+5+6]

6.a) Verify whether the transistor in the circuit shown in figure 1, conducts for the entire cycle of the input signal. Sketch the output signal waveform for a 20mV p-p sinusoidal input signal.

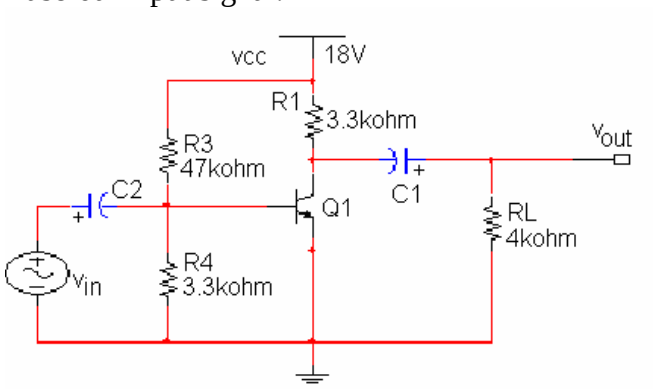

figure 1

b) If the transistor does not conduct for the entire input cycle, suggest necessary modifications to get maximum undistorted output signal swing. [8+8]

7.a) Compute the load regulation of a simple regulation of a simple series regulator for the specifications listed below:
Output voltage at minimum load current: 18V
Minimum & Maximum load current: 0 & 20 mA respectively
Output voltage at maximum load current: 16.64V

b) With the help of suitable schematic, explain the operation of a transistor series regulator with additional control transistor in the feedback loop.

c) Differentiate between overload protection and short circuit protection of a voltage regulator. [5+5+6]

8.a) Compute the load regulation of simple series regulator for the specifications listed below:
Output voltage at minimum load current: 9V
Minimum & Maximum load current: 0&30mA respectively
Output voltage at maximum load current: 8.24V

b) With the help of suitable schematic, explain the operation of a transistor shunt regulator with additional amplifier in the feedback loop.

c) Compare series and shunt voltage regulators. [5+5+6]

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