Set No. 1

II B.Tech I Semester Regular Examinations, November 2007
ELECTRONIC CIRCUIT ANALYSIS
(Common to Electronics & Communication Engineering and Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) With the help of necessary equations, discuss the variation of A_I, A_V, R_i, and R_o with R_S and R_L in Common Emitter configuration.

   (b) For a CE configuration, what is the maximum value of R_S for which R_o differs by no more than 10 percent of its value for $R_S = 0$. The h-parameter values are $h_{fe} = 50$, $h_{ie} = 1.1 \text{K}\Omega$, $h_{re} = 2.5 \text{x} 10^{-4}$, $h_{oe} = 25~\mu\text{A/V}$. [10+6]

2. A two-stage amplifier circuit (CE-CC configuration) is shown in figure 2. The h-parameter values are $h_{fe} = 50$, $h_{ie} = 2 \text{ K }\Omega$, $h_{re} = 6 \times 10^{-4}$, $h_{oe} = 25\mu\text{A/V}$.
   $h_{fc} = -51$, $h_{ic} = 2 \text{ K}\Omega$, $h_{rc} = 1$, $h_oc = 25\mu \text{ A/V}$.
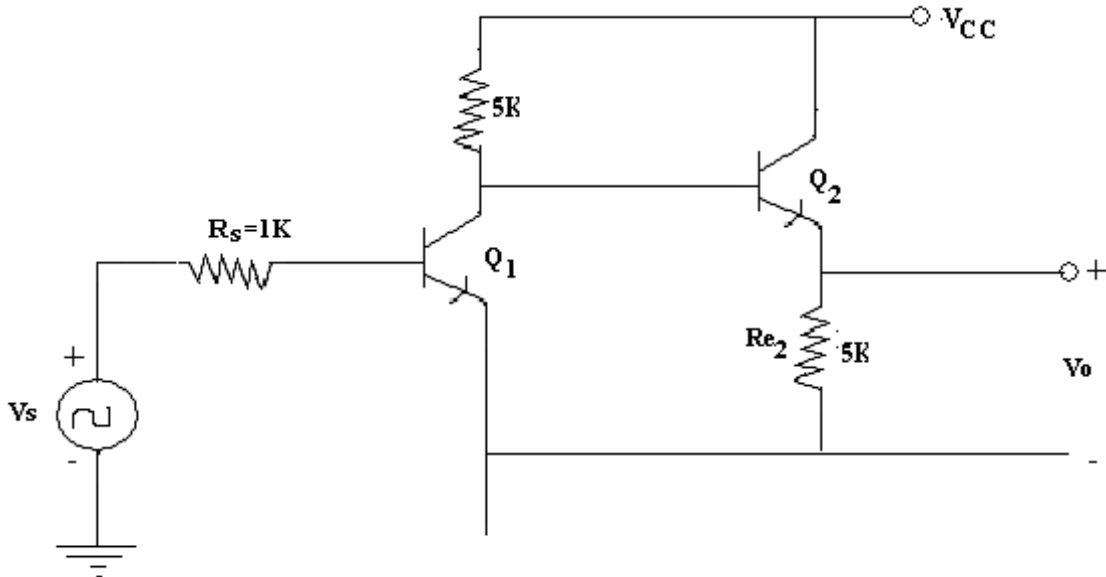   Find the input and output impedances and individual, as well as overall voltage and current gains.

Figure 2

3. (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 basewidth 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]. [8+8]

4. (a) In series fed Class - A power amplifier, explain the importance of the position of operating point on output signal swing. Show that the conversion efficiency is 25%.

   (b) Discuss the origin of various distortions in transistor amplifier circuits. [10+6]

5. Draw the circuit diagram of a Double tuned amplifier and derive the expression for 3-dB bandwidth. [16]

6. Explain the reasons for oscillations in a tuned amplifier. Briefly explain the methods used to stabilize the tuned amplifiers against oscillations? [16]

7. (a) Explain why voltage regulators are called as closed loop control systems?

   (b) A power Supply having output resistance of 2 ohms supplies a full-load current of 100mA to a 50 ohms load. Find the percent voltage regulation and no-load output voltage of the supply?

   (c) Draw and explain the load voltage and load current characteristic for a current limited regulator. [4+6+6]

8. (a) What is catcher diode and explain the necessity of catches diode in Switch Regulator with the help of circuit diagram.

   (b) List the operating ratings and electrical characteristics of IC 723. [8+8]

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Set No. 2

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Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
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⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Draw the circuit diagram of CB- amplifier and its h-parameter equivalent circuit. List out the characteristics of a CB amplifier.

   (b) In a single stage CB amplifier circuit, $R_E = 20K, R_C = 10K, V_{EE} = -20V, V_{CC} = 20V, R_L = 10K and R_S = 0.5K$. Find A_I, R_i, R_o, A_V .   (8+8)

2. (a) How are multistage amplifiers classified depending upon the type of coupling.

   (b) Write a note on distortions in amplifiers.

   (c) If eight identical amplifiers are cascaded each having f_H =200 KHz, determine the overall upper 3dB frequency f_h^*. Assume non interacting stages. [5+6+5]

3. Derive all components in the Hybrid - π model in terms of h parameters in CE configuration.   [16]

4. (a) Classify large signal amplifiers based on their operating point. Distinguish these amplifiers in terms of the conversion efficiency.   [8]

   (b) Draw the complimentary symmetry class-B power amplifier and explain its operation.   [8]

5. (a) Draw and explain the circuit diagram of a single tuned Capacitance coupled amplifier. Also explain its operation?

   (b) Draw and explain the significance of Gain versus Frequency curve of tuned amplifiers when they are used in radio amplifiers?

   (c) Draw the Ideal and actual frequency response curves of a single tuned amplifier?   [8+4+4]

6. (a) What is synchronous tuning ? Derive an expression for bandwidth of an n-stage synchronously tuned amplifier?

   (b) Show that for an 'n' stage synchronously tuned amplifier, maximum. bandwidth is obtained when the single stage gain is 4.34dB.   [8+8]

7. (a) Draw and explain a circuit which limits the current that can be drawn from the supply to a certain specific maximum.

   (b) Determine the minimum and maximum values for series resistor, required for a zener diode regulator with an output voltage of 5.6V, if the supply voltage varies from 10 V to 50V. The maximum load current is 20mA and minimum zener current is 3 mA.   [8+8]

8. (a) Specify suitable component values to get Vo=7.5V in the circuit of (Given figure8a). Using a 7805 regulator. From data sheet. I_Q=4.2mA and V_R=5V, choose I_{R1}=25mA.
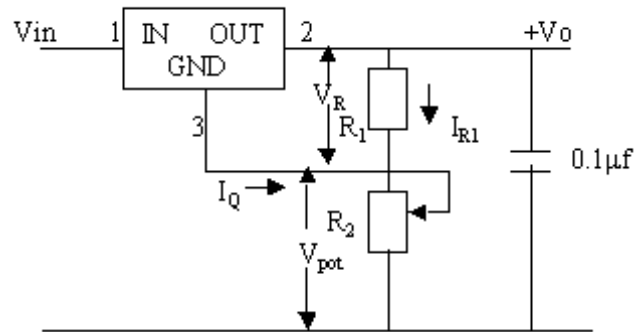

Figure 8a

(b) Draw the functional diagram SMPS and explain its operation.

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Set No. 3

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Draw the circuit diagram and low frequency equivalent circuit of common source amplifier and derive an expression for its voltage gain.

   (b) For the emitter follower circuit with $R_S = 0.5$K and $R_L = 5$K, calculate A_I, R_i, A_V, A_{VS}, and R_0. Assume, $h_{fe} = 50$, $h_{ie} = 1$K, $h_{oe} = 25$ μA/V. [8+8]

2. (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 1 dB down at 30 Hz compared to mid band. Calculate the lower cutoff frequency of the individual stages. [8+8]

3. (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 basewidth 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]. [8+8]

4. (a) Classify large signal amplifiers based on its operating point. Distinguish these amplifiers in terms of the conversion efficiency. [8]

   (b) Draw the push-pull power amplifier circuit. Derive the expression for the output current in push ?pull amplifier with base current as $i_b = I_{bm} \sin wt$. [8]

5. (a) Draw and explain the circuit diagram of a single tuned Capacitance coupled amplifier. Also explain its operation?

   (b) Draw and explain the significance of Gain versus Frequency curve of tuned amplifiers when they are used in radio amplifiers?

   (c) Draw the Ideal and actual frequency response curves of a single tuned amplifier? [8+4+4]

6. Explain how the stagger-tuned design is superior over synchronously tuned design in the design of a multistage amplifier? Also draw their circuit diagrams and their equivalent circuits? [16]

7. (a) What is Voltage regulator? Explain with the help of neat circuit diagram how zener diode is used as a shunt voltage regulator?

(b) In figure 7 shown Vi=20V, Rs=200 ohms and Vz=12V, VBE =0.65V find output voltage, collector to emitter voltage of the transistor and the current in 200 ohms resistor? [8+8]
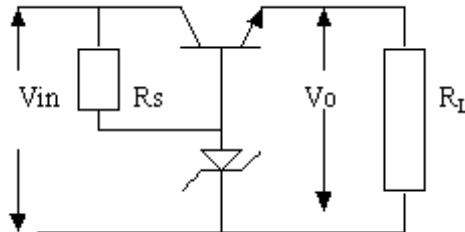

Figure 7

8. (a) Draw and explain the output of pulse width modulator for different types of inputs with respect to switching regulator.

(b) Draw the circuit and explain the operation of basic switching type regulator. [8+8]

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$$\boxed{\textbf{Set No. 4}}$$

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Time: 3 hours   **Max Marks: 80**
Answer any FIVE Questions
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1. (a) Draw the circuit diagram of CB- amplifier and its h-parameter equivalent circuit. List out the characteristics of a CB amplifier.

   (b) In a single stage CB amplifier circuit, $R_E = 20K, R_C = 10K, V_{EE} = -20V, V_{CC} = 20V, R_L = 10K and R_S = 0.5K$. Find A_I, R_i, R_o, A_V .   (8+8)

2. (a) How multistage amplifiers are classified depending upon the type of coupling.

   (b) Write a note on distortions in amplifiers.

   (c) In an R-C coupled amplifier, $A_{VM} = 60, f_L = 50Hz$ and f_H=100KHz. Find the values of frequencies at which the gain reduces to 50 on either side of mid band region.   [4+6+6]

3. (a) What are the typical values of various components in Hybrid - π model? Show that at low frequencies the Hybrid - π model with $r_{b'e}$ and r_{ce} taken as infinite reduces to the approximate CE h- parameter model.

   (b) The following low- frequency parameters are known for a given transistor at $I_C = 10mA, V_{CE}$ =10 V, and at room temperature,
   $h_{ie} = 500\ \Omega$
   $h_{oe} = 4x10^{-5}$ A/V
   $h_{fe} = 100$
   $h_{re} = 10^{-4}$.
   At the same operating point, $f_T = 50$MHz and C_c=3PF, compute the values of all the Hybrid - π parameters   [8+8]

4. (a) Define thermal resistance of a power BJT.

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

      i. The thermal resistance between the junction and the case.

      ii. The thermal resistance between the junction and ambient.

      iii. Maximum power dissipation capability for safe operation in free space at a temperature of 50^0C.   [4+4x3]

5. (a) What is meant by the term Tuned amplifier and briefly explain the various methods of classification of tuned amplifiers?

(b) A constant generator drives a parallel tuned circuit consisting of a loss less capacitor 'C' and a coil 'L' (having small resistance 'R'). Derive the expression for the frequency of resonance? [8+8]

6. (a) Explain the principle of a wideband amplifier?

(b) Derive the expression for Optimum value of collector circuit resistor (R_C, opt) of one stage of a CE cascade amplifier. Draw the graph showing the variation of Bandwidth, Gain and Gain bandwidth product as a function of R_C and write the comments from the graph to improve the bandwidth. [4+12]

7. (a) With the help of a neat circuit diagram, explain the operation of BJT shunt voltage regulator.

(b) What is a voltage reference? Why is it needed?

(c) What is the function of a series pass transistor? [8+4+4]

8. (a) Explain how three terminal IC 7805 is used as a current source with a neat circuit diagram. [8]

(b) What is a Voltage multiplier? Draw and explain any one circuit of it and give its applications. [8]

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