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

II B. Tech II Semester Regular Examinations, August - 2014
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) Derive the equations for the current gain, input impedance, voltage gain and output impedance of an emitter follower operating at low frequencies in terms of common emitter h-parameters
   b) Using Miller's theorem, prove that for a CE amplifier with resistive load the output voltage is $-g_mR_L$ (8M+7M)

2. a) A Common source FET amplifier has a load resistance of 500kΩ. The ac drain resistance of the device is 100kΩ and the transconductance is $0.8mAV^{-1}$. Calculate the voltage gain of the amplifier.
   b) Draw the block diagrams of four types of negative feedback amplifier circuits and explain which amplifier can be used to get higher input impedance and lower output impedance with appropriate derivation (8M+7M)

3. a) Draw the circuit diagram of Colpitt's oscillator. Explain its disadvantages. How it is overcome with Clapp oscillator.
   b) Prove that in an RC-phase shift oscillator, the minimum h_{fe} required is 29 to sustain the frequency of oscillations (8M+7M)

4. a) For a cascaded CE-CC configuration, the h-parameters are given as h_{ie}=1kΩ, $h_{re}=10^{-4}$, h_{fe}=50, hoe=10^{-4} A/V, h_{ic}=1kΩ, h_{rc}=1, h_{fc}= -51, $h_{oc}=10^{-4}$ A/V. Find the input and output impedances of the cascaded configuration
   b) Derive the expressions for overall voltage gain, current gain and power gain, when two identical amplifier stages are cascaded (8M+7M)

5. a) Define f_β and f_T and also derive the relation between them
   b) Given the following transistor measurement made at I_c = 5 mA, V_{ce} = 10V and at room temperature: h_{fe} = 100, h_{ie} = 600 ohm, Ai = 10 at 10MHz, C_c= 3 pF. Calculate f_β, f_T, C_e, $r_{b',e}$ and $r_{bb'}$. (8M+7M)

6. a) Derive the efficiency of the class-B power amplifier. Though class-B single ended power amplifier efficiency is high, why it is not used in practical circuits? Explain in detail.
   b) What are the disadvantages of using transformers in a push-pull amplifier? Explain a few techniques that eliminates the use of input transformers (8M+7M)

7. a) Compare single and double tuned amplifiers. Draw the circuit of double tuned amplifier and also explain how the frequency response of this amplifier is better than the single tuned amplifier
   b) What is importance of stagger tuning? Explain briefly about stagger tuned amplifiers. (8M+7M)

8. a) Explain how overload protection is provided in series voltage regulator
   b) Distinguish between series voltage regulator and shunt voltage regulator. (8M+7M)
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Code No: R22043 **R10** SET - 2

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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Derive the equation for voltage gain and input impedance of a common source JFET amplifier with the help of its circuit diagram and its equivalent circuit.
   b) Calculate A_i R_i, A_v, R_o for the CC amplifier circuit with CE h-parameters given by h_{fe}=50, h_{ie}=1k, h_{oe} = 50k also the resistance parameters given by R_L=1k Ω, R_S= 100Ω, R_1 = 100k Ω, R_2 = 10kΩ, R_E = 1kΩ (7M+8M)

2. a) Apply the method of feedback circuit analysis for a voltage series feedback amplifier and explain all steps with appropriate diagrams
   b) Prove that negative feedback in amplifiers reduces the distortion and noise with appropriate equations (7M+8M)

3. a) Derive the equation for frequency of oscillations of a FET RC-phase shift Oscillator and also derive condition for sustained oscillations.
   b) Prove that the gain of Wien bridge oscillator using BJT amplifier must be at least 3 for the oscillations to occur. (7M+8M)

4. a) Show that the input impedance and overall voltage gain of a Darlington pair is much larger compared to an individual CE amplifier with same transistor.
   b) Derive the expression for current gain of a two stage RC coupled CE amplifiers (7M+8M)

5. a) What is Giacelletto model of a transistor? Discuss about various parameters in the model.
   b) Derive an expression for voltage gain of common source amplifier at high frequencies. (7M+8M)

6. a) Explain how the power amplifiers are classified based on class of operation and also compare them
   b) A single transistor is operating as an ideal class B amplifier with a 1-K load. A dc meter in the collector circuit reads 10mA. How much signal power is delivered to the load? (7M+8M)

7. a) Explain the operation of a single tuned amplifier circuit and its frequency Response.
   b) Derive the efficiency of class C tuned amplifier and explain its operation (7M+8M)

8. a) Distinguish between overload and over current protection in regulators?
   b) Explain the operation of a Zener diode as a Voltage Regulator (7M+8M)
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Answer any **FIVE** Questions
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1. a) Derive the equation for the gain of a common emitter amplifier with emitter resistance and also explain the effect of emitter resistance on the gain
   b) What is small signal model of a FET. Derive the relationship between small signal parameters of a FET. (7M+8M)

2. a) An Amplifier with negative feedback gives an output of 12.5V with an input of 1.5V. When feedback is removed, it requires 0.25V input for the same output. Find i) Value of voltage gain without feedback ii) Value of β, if the input and output are in phase and β is real.
   b) Explain the procedure to obtain the basic amplifier configuration without feedback but taking the loading of the feedback network into account (7M+8M)

3. a) Derive the expression for frequency of oscillation of BJT phase-shift oscillator and explain its operation with neat circuit diagram
   b) A crystal oscillator has the following parameters: L=0.33H, C=0.065pF, C=1.0pF and R=5.5 kΩ. i) Find the series resonant frequency. ii) Find the Q of the crystal. (7M+8M)

4. a) What is frequency response of an amplifier? Draw the equivalent circuits of RC coupled amplifier at low and high frequencies and derive the expression for voltage gain.
   b) Two FET based amplifiers with gains of 30 dB are cascaded together. Find the overall gain. Also find bandwidth of the overall circuit, if individual lower and higher 3 dB frequencies are 20 Hz and 20 kHz respectively. (7M+8M)

5. a) Draw the high frequency hybrid π model of a BJT and explain the each parameter of the Model with appropriate equation.
   b) Derive the equations for transconductance and input conductance of CE amplifier using high frequency model. (7M+8M)

6. a) Derive the expression for Maximum efficiency and working of transformer coupled Class A Amplifier
   b) Define collector circuit efficiency of a power amplifier and explain how total distortion can be reduced in a power amplifier through push-pull configuration. (7M+8M)

7. a) Show that for an “n” stage synchronously tuned amplifier, maximum. bandwidth is obtained when the single stage gain is 4.34 dB.
   b)Explain how the stagger-tuned design is superior to synchronously tuned design in the design of a multistage amplifier? (7M+8M)

8. a) Describe the operation of a BJT series regulator and derive the equations for load and line regulations
   b) List and explain current limiting techniques used in voltage regulators (7M+8M)
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1. a) An Emitter follower circuit has the following parameters R_L=1kΩ, R_S= 50Ω, h_{fe}=50, h_{ie} = 1kΩ, h_{oe} = 50kΩ, R_1 = 100kΩ, R_2 = 10kΩ, R_E = 10kΩ. Calculate R_i, R_o,A_v, and A_i for the above circuit.
   b) Derive an expression for the voltage gain of common source amplifier by using low frequency equivalent circuit. (7M+8M)

2. a) An amplifier has a mid band gain of 125 and bandwidth of 250 kHz. If 4% negative feedback is introduced and the new bandwidth and gain.
   b) Derive the equations for voltage gain, input impedance and output impedance of a CE amplifier with current-shunt negative feedback. (7M+8M)

3. a) Find the capacitance C and h_{fe} for the transistor Phase-Shift oscillator to provide a resonating frequency of 10kHZ. Assume R_1=25kΩ, R_2=60 kΩ, R_c=40kΩ, R=7.1kΩ and h_{ie}=1.8kΩ.
   b) Explain barkhausen criterion for sustained oscillations and also explain how the criterion is satisfied in a BJT RC- Phase-Shift oscillator (7M+8M)

4. a) For a Darlington pair the overall current gain and input impedance with an emitter resistance are given as 1130Ω and 1.2 *M*Ω respectively. Calculate the value of emitter resistance $R_{E.}$
   b) Three identical stages of amplifiers cascaded with lower and upper cut off frequencies given by 300Hz and 5kHz respectively, compute the overall lower and higher cut off frequencies with appropriate equations. (7M+8M)

5. a) The following low frequency parameters are known for a given transistor at I_c = 10 mA, V_{CE} =5V, h_{ie} = 500, h_{oe} = 10–5A/V, h_{fe} = 100, h_{re} = 10–4. At the same operating point f_T = 50 MHz, and C_c = 3 PF, compute the values of all the hybrid-π parameters.
   b) Draw the circuit of single stage RC coupled BJT amplifier. Discuss the effect of an emitter bypass capacitor on low frequency response. (7M+8M)

6. a) Differentiate between push-pull and complementary-symmetry configurations of a class B power amplifier.
   b) Explain the reasons for crossover distortion in class-B power amplifiers and suggest a suitable circuit for its minimization. (7M+8M)

7. a) Explain the working of Single Tuned Amplifier with circuit diagram.
   b) Explain the significance of various levels of coupling of transformer used in double tuned amplifiers with necessary diagrams. (7M+8M)

8. a) Explain the operation of BJT shunt voltage Regulator with the help of a neat circuit Diagram
   b)Explain short circuit and overload protections in a voltage regulator through relevant circuits. (7M+8M)
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