

II B.Tech I Semester, Supplementary Examinations, May – 2012

ELECTRONIC CIRCUIT ANALYSIS
(Electronics and Communication Engineering)

Time: 3 hours

Max Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

1. a) Sketch CS amplifier using JFET and draw its signal equivalent circuit.
b) In the above circuit, if $V_{dd} = 15V$, $I_{DSS} = 2mA$, $V_p = -2.4V$, $R_D = 10K\Omega$, $R_G = 1M\Omega$, $R_S = 470\Omega$.
Find A_v , g_m , V_{D_s} , I_D and V_{G_s} . (8M+8M)
2. a) Compute the values of overall current gain and input impedances of a Darlington pair with $1K\Omega$ emitter resistance connected to the emitter of second transistor if h_{fc} , h_{ic} , h_{oc} and h_{rc} of both the transistors are given as -51, $1.1K\Omega$, 0 and 1 respectively.
b) List the salient features of cascade and Darlington pair amplifiers. (8M+8M)
3. a) Show that the hybrid Π model is valid for frequencies up to approximately $f_T/3$.
b) Explain how parameters of hybrid Π model vary with I_C , V_{CE} and temperature. (8M+8M)
4. a) Show that the maximum conversion efficiency of series fed and transformer coupled class A power amplifiers are 25% and 50% respectively.
b) What are the types of distortions possible in an amplifier?
c) Write an expression for total harmonic distortion in terms of its fundamental and harmonic components. (6M+5M+5M)
5. a) Draw the equivalent circuit of a capacitance coupled single tuned amplifier and derive the equation for voltage gain.
b) In a single tuned amplifier, the circuit bandwidth is 5 KHz, and the voltage gain has maximum at 1000KHz, when the tuning capacitor is adjusted to 500pF. Calculate the Q of the circuit and the coil inductance. (8M+8M)
6. a) What is stagger tuning? How it is different from synchronous tuning, derive an expression for the selectivity of stagger tuned amplifier.
b) Draw the circuit of class-B tuned RF amplifier and explain its working. (8M+8M)
7. a) With the help of suitable circuit diagram explain the operation of a series voltage regulator with simple current limiting feature implemented.
b) Compute the value of R_{SC} in a current limited series voltage regulator which initiates current limiting action for fixing the maximum load current to 180mA from a 24 volt regulator. Estimate whether the regulator is in current limiting for load resistance of
i) 100Ω and ii) 20Ω (8M+8M)
8. a) With neat circuit diagram explain the working principle of IC 723 voltage regulator.
b) Draw the circuit for 7805 voltage regulator IC and explain its working. (8M+8M)

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1. a) With the help of equivalent circuit, derive the expressions for 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 $R_S = 1K\Omega$ and $R_L = 5K\Omega$ calculate A_i , R_i , A_v , A_{v_s} and R_o . Assume $h_{fe} = 75$, $h_{ie} = 1.1K\Omega$, $h_{oe} = 25\mu A/v$ (8M+8M)
2. a) Four identical cascaded stages have an overall upper 3-dB frequency of 20 KHz and a lower 3-dB frequency of 20Hz. What are f_L and f_H of each stage? Assume non interacting stages?
b) When 2-stages of identical amplifiers are cascaded, obtain the expressions for overall voltage gain, current gain and power gain. (8M+8M)
3. a) From the hybrid $-\pi$ equivalent circuit of BJT at high frequencies, derive expressions for output, input conductances (g_{ce} and g_{be}) and the transconductance (g_m) in terms of its low frequency hybrid parameters.
b) Compute the values of overall higher and lower cut-off frequencies if the individual higher and lower cutoff frequencies of a two identical amplifier cascade are 16 KHz and 1.2 KHz respectively. (8M+8M)
4. a) Explain the method of determination of total harmonic distortion in push-pull power amplifiers using 5 point analysis.
b) Determine the input power, output power and efficiency for a class B power amplifier circuit with $V_{cc} = 25V$, $I_m = 1$ Amp, $R_L = 10\Omega$. (8M+8M)
5. a) Explain the reasons for potential instability in tuned amplifiers?
b) Explain with circuit diagram and frequency response as to how the problem of potential instability is overcome in a double tuned amplifier? (6M+10M)
6. a) What are the advantages of class-C operating mode in RF applications.
b) Draw the circuit of class-C RF amplifier and explain its operation with necessary waveforms. (6M+10M)
7. a) What type of protection circuits are required in power supplies?
b) A 50 V power supply has line regulation 0.2%V. How large would the 75V input voltage to the supply have to become for the output voltage to rise to 52V?
c) Give the disadvantages of the series and shunt regulators? (4M+6M+6M)
8. a) Draw the circuit diagram of voltage doubler and voltage tripler and explain their working.
b) Draw the circuit of 7805 voltage regulator. Derive the expression for load current. (8M+8M)

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1. a) Compare CE, CC and CB amplifier in terms of voltage and current gains and input and output impedances.  
b) In the emitter follower circuit shown  $R_1=12K\Omega$ ,  $R_2= 10K\Omega$ ,  $R_E=3.3K\Omega$  and  $R_S=600K\Omega$  Calculate the output impedance of the amplifier and peak-to-peak output voltage for  $V_{in}=30V(p-p)$ . Assume typical values of h-parameters and  $R_L=18K\Omega$  (8M+8M)
2. a) Draw the circuit of two stage RC coupled JFET amplifier and explain its working.  
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+8M)
3. a) Derive the expression for Hybrid- $\pi$  conductance in terms of low frequency h-parameters.  
b) Following measurements of a certain transistors are available at room temperature and with  $I_c = 5mA$ ,  $V_{CE}= 10V$ ,  $h_{fe}=100$ ,  $h_{ie}=600\Omega$ .  $[A_{ie}]=10$  at 10MHz.  $C_c =3pF$ . Calculate  $f_\beta$ ,  $f_T$ ,  $C_e$   $r_{be}$  and  $r_{bb}$ . (8M+8M)
4. a) Show the even harmonics cancel out and overall distortion reduces in a class B amplifier when connected in push-pull configuration.  
b) For a class B amplifier driven from a 24 volts power supply and driving an  $8\Omega$  load compute i) input power (DC) ii) Output power and iii) conversion efficiency if the peak-peak output voltage across the load resistance 22volts (maximum) (8M+8M)
5. a) Draw the circuit for single tuned capacitive coupled amplifier and explain for  $(A/A_{reso})$   
b) Draw the circuit for double tuned Amplifier. Explain its working, Derive the expression for maximum gain. (8M+8M)
6. a) Explain why the compensation is employed in wide band amplifiers.  
b) Explain how the shunt compensation techniques are used to extend the low frequency and high frequency range. (8M+8M)
7. a) What is the function of a voltage regulator? Give the important parts of series regulated power supply using discrete components. Explain.  
b) What are the demerits and merits of series regulators? (8M+8M)
8. Describe the following function briefly:  
a) Full wave voltage doublers and triplers.  
b) Three-terminal IC voltage regulators.  
c) Uninterrupted power supply (UPS) (6M+5M+5M)

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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) For the emitter follower with  $R_s = 0.5K\Omega$  and  $R_L = 5K\Omega$ , Calculate  $A_i$ ,  $R_i$ ,  $A_v$ ,  $A_{v_s}$  and  $R_o$ . Assume  $h_{fe} = 50$ ,  $h_{ie} = 1k\Omega$ ,  $h_{oe} = 25\mu A/v$  (8M+8M)
2. a) Draw the circuit diagram of cascade-transistor amplifier circuit and analyze its performance.  
b) Draw the circuit diagram for differential amplifier and perform the analysis with its equivalent circuit. (8M+8M)
3. a) Draw Hybrid- $\pi$  model of transistor in CC configuration using CE hybrid- $\pi$  parameters.  
b) Remove all capacitors from the above emitter-follower equivalent circuit and find the input impedance and output impedance. (8M+8M)
4. a) Derive the expression for maximum value of conversion efficiency of class-A power amplifier.  
b) Explain about class D and class S power amplifiers. Mention their salient features and applications. (8M+8M)
5. a) Derive expressions for band width of a capacitive coupled single tuned amplifier in terms of the circuit element values and performance parameters with the help of suitable circuit diagram and equivalent circuit.  
b) List the merits and demerits of tapped capacitively coupled, inductively coupled and transformer coupled single tuned amplifier (8M+8M)
6. a) Derive the expression for the gain of a double tuned amplifier Discuss about its selectivity.  
b) Differentiate between stagger tuning and synchronous tuning of multistage tuned amplifiers. (8M+8M)
7. a) Draw the circuit for series type voltage regulator and explain its working.  
b) Design a Zener-shunt regulator with the specifications using a Zener- diode with  $V_z = 10V$ , Input supply voltage varies from 15V to 25V and the load current varies between 0 and 15mA. Also determine the line and load regulation. (8M+8M)
8. a) With neat circuit diagram explain the working principle of IC 723 voltage regulator  
b) Draw the circuit of 7805 voltage regulator IC and explain its working. (8M+8M)