

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 8746

C

Roll No.....

Unique Paper Code : 251303

Name of the Paper : ELHT-302 : Analog Electronics – I

Name of the Course : B.Sc. (Hons) Electronics, Part – II

Semester : III

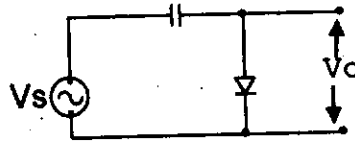
Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt FIVE Questions in all.
3. Question No. 1 is Compulsory.
4. Attempt any FIVE parts of Question No. 1.
5. Use of Scientific Calculator is allowed.

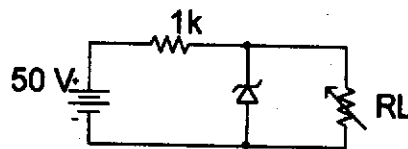
1. (a) If $V_s = V_m \sin(\omega t)$, plot the output waveform for the following circuit and give suitable explanation for the same. (3 Marks)



- (b) Define α and β for the case of transistor amplifier and derive a relation between the two. (3 Marks)
- (c) For an amplifier connected in CE mode, calculate the values of β , I_c and I_E . Given $\alpha = 100$ and $I_B = 50 \mu A$. (3 Marks)
- (d) A phase shift oscillator uses three identical RC sections in the feedback network, using $R = 100 \text{ k}\Omega$ and $C = 0.01 \mu F$. Calculate the frequency of oscillations. (3 Marks)
- (e) What is TUF ? Give the significance of TUF for a power supply. (3 Marks)

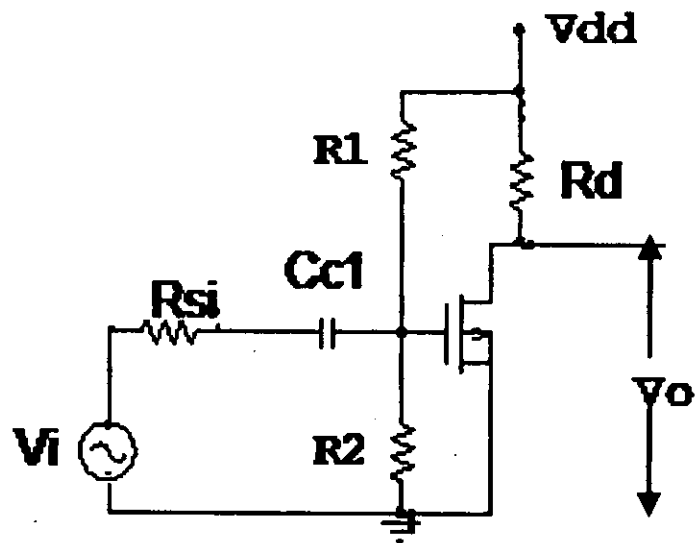
P.T.O.

- (f) An amplifier with 10% negative feedback has an open loop gain of 50. If open loop gain increases by 10% what is the percentage change in the closed loop gain. (3 Marks)
- (g) What are Power Amplifiers? Classify them on the basis of efficiency. (3 Marks)
2. (a) Give the construction of a power supply with the help of a block diagram explaining each block. Derive the expression for the ripple factor for a shunt capacitor filter. (8 Marks)
- (b) For the following circuit, determine the range of R_L and I_L to maintain a constant output at 10V. Input voltage is 50 V and maximum diode current $I_{zm} = 32\text{mA}$. Determine the diode rating also. (5 Marks)



- (c) Determine the nominal voltage for a Zener diode of $V_z = 12\text{V}$, at 373K. Temperature Coefficient = $0.072\%/^{\circ}\text{C}$. (2 Marks)
3. (a) With the help of Hybrid equivalent circuit diagram, derive the expression of voltage gain for low- & mid-frequencies of a CE amplifier. (8 Marks)
- (b) For a voltage divider bias circuit with $V_{CC} = 15\text{V}$, $R_1 = 8\text{ k}\Omega$, $R_2 = 4\text{ k}\Omega$, $R_C = 900\text{ k}\Omega$, $R_E = 1\text{ k}\Omega$ and $h_{fe} = 50$, determine values of I_C and V_{CE} using approximate analysis. (7 Marks)
4. (a) Derive the expression for the maximum efficiency of a transformer coupled Class A amplifier. (5 Marks)
- Compare the efficiencies of class A amplifier with a resistive load with that of class A transformer coupled amplifier. Justify your answer. (3 Marks)

- (b) Explain the concept of "Cross Over Distortion" and how it can be overcome. (3 Marks)
- (c) Calculate the lower cut-off frequency for a CE amplifier given the values of Coupling Capacitor (C_C) = $2\mu\text{F}$, $R_s=1\text{ k}\Omega$, $h_{ie}=1\text{ k}\Omega$, $h_{fe}=80$, $R_1=5\text{ k}\Omega$, $R_2=3\text{ k}\Omega$, $R_C=0\text{ k}\Omega$. (4 marks)
5. (a) For a current shunt feedback configuration, derive the expressions for input impedance and output impedance. Compare R_{if} , R_{of} with R_i , R_o qualitatively and where symbols have their usual meaning. (8 Marks)
- (b) Prove that Gain Bandwidth product remains constant for a negative feedback amplifier. (4 Marks)
- (c) Calculate the closed loop gain for the negative feedback amplifier when open gain $A_v = 100,000$ and $\beta = 1/100$. Also calculate closed loop gain when A_v is increased by 50%. (3 Marks)
6. (a) Derive the expression for the frequency of oscillations of a phase shift oscillator using three RC network. Also determine the minimum gain of the amplifier for sustained oscillations. (8 Marks)
- (b) Explain Barkhausen criterion for oscillations. (2 Marks)
- (c) It is required to generate an output frequency of 100 kHz using colpitts oscillator. Determine the value of C_1 and C_2 given $L=0.5\text{ mH}$. Assume ($C_1=C_2$). (5 Marks)
7. (a) For the given circuit determine the small signal voltage gain and input and output resistances given $V_{DD}=12\text{V}$, $R_1=100\text{ k}\Omega$, $R_2=40\text{ k}\Omega$, $R_D=5\text{ k}\Omega$. The transistor parameters are: $V_{TN}=2\text{V}$, $K_n=0.5\text{ mA/V}^2$, $\lambda=0.01\text{V}^{-1}$, $R_{si}=5\text{ k}\Omega$. Here the symbols have their usual meaning. (10 Marks)



- (b) Draw the dc load line for CS MOSFET amplifier. Define and elaborate on Q point and transition point. (5 Marks)