CBCS SCHEME

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18EE34

Third Semester B.E. Degree Examination, Aug./Sept.2020
Analog Electronic Circuits

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the working of series clipper to clip the input sinusoidal signal: (i) above V_R (ii) below V_R . Draw the input and output waveforms and transfer characteristic. Neglect cut in voltage V_r. Assume clipping action in positive half cycle of input signal. **(06 Marks)**

b. Define operating point in a transistor and explain its significance. **(04 Marks)**

c. Explain the dc analysis of emitter stabilized bias circuit, for this circuit if R_c = 1 kΩ, R_B = 220 kΩ, R_E = 1 kΩ, calculate I_B, I_C, I_E V_{CE} and V_B . Assume β = 200. **(10 Marks)**

OR

2 a. For collector to base bias circuit obtain expressions for stability factors S_{ICO} , S_{UBE} and S_β . **(10 Marks)**

b. Design a voltage divider bias circuit if V_{CC} = 12V, V_{CE} = 6V, V_E = 1V, I_C = 1 mA, S_{ICO}= 20, β = 100. Draw the circuit **(10 Marks)**

Module-2

3 a. Develop h-parameter model for transistor amplifier, hence draw h-parameter model for CB, CE and CC modes. **(10 Marks)**

b. For a single stage CE amplifier, R_s = 1 kΩ, R_1 = 50 kΩ, R_2 = 2 kΩ, R_c = 2 kΩ, R_L = 2 kΩ, h_{fe} = 50, h_{oe} = 25 μA/V , h_{ie} = 1.1 kΩ and $h_{re} = 2.5\times10^{-4}$. Calculate A_V, R_i, A_i, A_{IS} , A_{VS} and R_0. Draw the circuit diagram. Use approximate hybrid model. Across RE, bypass capacitor is used. **(10 Marks)**

OR

4 a. For common emitter amplifier with collector to base bias circuit, determine A_I, Z_i, A_v, A_{VS}, A_{IS} and Z'_0. Draw circuit diagram. R_B = 200 kΩ, R_c = 10 kΩ, h_{ie} = 1.1 kΩ, h_{fe} = 50, $h_{oe} = h_{re} = 0$ and R_s = 1 kΩ. **(10 Marks)**

b. For emitter voltage follower circuit, obtain expression for A_I , Z_i , A_V , R_0 and R_0'. Use approximate hybrid model. Also state features of emitter follower circuit. **(10 Marks)**

Module-3

5 a. For the Darlington connection, obtain expression for A_{I2} , R_{i2} for II stage and A_{I1} , R_{i1} for I stage. **(10 Marks)**

b. Consider a 2 stage RC coupled amplifier for the I stage R_S = 1 kΩ, R_{C1}=15 kΩ , R_{E1} = 100 Ω R_1 = 200 kΩ , R_2 = 20 kΩ. For II stage R_{C2} = 4 kΩ, R_{E2} = 330 Ω, biasing resistors R_3 = 47 kΩ, R_4 = 4.7 kΩ. Bypass capacitor is connected across R_{E1} and R_{E2}. Assume h_{ie} = 1.2 kΩ, h_{fe} = 50, h_{oe} = 25 μA/V, $h_{re} = 2.5\times10^{-4}$, Determine the overall A_V , A_{VS} , R_{0_1}' and R_{0_2}'. Draw the circuit diagram. **(10 Marks)**

OR

6 a. Explain the concept of voltage amplifier, current amplifier, transconductance amplifier and transresistance amplifier using Thevenin's or Norton's equivalent circuit. **(10 Marks)**

b. For voltage shunt feedback amplifier topology, obtain expressions for R_{if} and R_{of}. **(10 Marks)**

Module-4

7 a. Obtain an expression for 2nd harmonic distortion in a power amplifier using 3-point method. **(10 Marks)**

b. A class-B push pull amplifier supplies power to a resistive load of 12 Ω. The turns ratio of output transformer is 3:1 and $\eta = 78.5\%$. Determine the maximum power output, maximum power dissipation in each transistor maximum base and collector current in each transistor. Assume $V_{cc} = 20$ V and $h_{fe} = 25$. **(10 Marks)**

OR

8 a. Obtain expression for f_0 and h_{fe} in Colpitt's RF oscillator. **(10 Marks)**

b. Compare RC phase shift and Wein bridge oscillator. **(05 Marks)**

c. Calculate the values of R and C in a RC phase shift oscillator if $f_0 = 500$ Hz. Draw the circuit diagram. Assume $C = 0.1$ μF. **(05 Marks)**

Module-5

9 a. Explain construction, operation and characteristics of enhancement MOSFET. **(10 Marks)**

b. Compare D-MOSFET and E-MOSFET. **(05 Marks)**

c. Define transconductance "g_m" in FET and Show that $g_m = g_{m_o}\left(1 - \frac{V_{GS}}{V_P}\right)$ **(05 Marks)**

OR

10 a. Consider voltage divider bias circuit of JFET. If $R_D = 1.2$ kΩ, $R_S = 2$ kΩ, $R_1 = 20$ kΩ, $R_2 = 10$ kΩ, $V_{DD} = 12$V, $I_{DSS} = 12$ mA, $V_P = -4$V, calculate I_D, V_{GS}, V_G, V_{DS} and V_S. Draw the circuit diagram. **(10 Marks)**

b. Consider JFET in fixed bias mode. Derive expressions for Z_{in}, Z_0 and A_V. If $R_G = 1$ MΩ, $r_d = 50$ kΩ, $g_m = 2$ m^s, calculate Z_i, A_v and Z_0. Draw the circuit diagram $R_D = 5.1$ kΩ. **(10 Marks)**

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