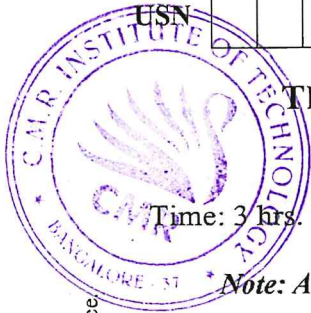


# CBCS SCHEME

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

- 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)
  - Define operating point in a transistor and explain its significance. (04 Marks)
  - Explain the dc analysis of emitter stabilized bias circuit, for this circuit if  $R_c = 1 \text{ k}\Omega$ ,  $R_B = 220 \text{ k}\Omega$ ,  $R_E = 1 \text{ k}\Omega$ , calculate  $I_B$ ,  $I_C$ ,  $I_E$ ,  $V_{CE}$  and  $V_B$ . Assume  $\beta = 200$ . (10 Marks)

### OR

- For collector to base bias circuit obtain expressions for stability factors  $S_{ICO}$ ,  $S_{UBE}$  and  $S_{\beta}$ . (10 Marks)
  - Design a voltage divider bias circuit if  $V_{CC} = 12\text{V}$ ,  $V_{CE} = 6\text{V}$ ,  $V_E = 1\text{V}$ ,  $I_C = 1 \text{ mA}$ ,  $S_{ICO} = 20$ ,  $\beta = 100$ . Draw the circuit (10 Marks)

### Module-2

- Develop h-parameter model for transistor amplifier, hence draw h-parameter model for CB, CE and CC modes. (10 Marks)
  - For a single stage CE amplifier,  $R_s = 1 \text{ k}\Omega$ ,  $R_1 = 50 \text{ k}\Omega$ ,  $R_2 = 2 \text{ k}\Omega$ ,  $R_c = 2 \text{ k}\Omega$ ,  $R_L = 2 \text{ k}\Omega$ ,  $h_{fe} = 50$ ,  $h_{oe} = 25 \mu\text{A/V}$ ,  $h_{ie} = 1.1 \text{ k}\Omega$  and  $h_{re} = 2.5 \times 10^{-4}$ . Calculate  $A_V$ ,  $R_i$ ,  $A_i$ ,  $A_{IS}$ ,  $A_{VS}$  and  $R_o$ . Draw the circuit diagram. Use approximate hybrid model. Across  $R_E$ , bypass capacitor is used. (10 Marks)

### OR

- For common emitter amplifier with collector to base bias circuit, determine  $A_i$ ,  $Z_i$ ,  $A_V$ ,  $A_{VS}$ ,  $A_{IS}$  and  $Z_o$ . Draw circuit diagram.  $R_B = 200 \text{ k}\Omega$ ,  $R_c = 10 \text{ k}\Omega$ ,  $h_{ie} = 1.1 \text{ k}\Omega$ ,  $h_{fe} = 50$ ,  $h_{oe} = h_{re} = 0$  and  $R_s = 1 \text{ k}\Omega$ . (10 Marks)
  - For emitter voltage follower circuit, obtain expression for  $A_i$ ,  $Z_i$ ,  $A_V$ ,  $R_o$  and  $R_o'$ . Use approximate hybrid model. Also state features of emitter follower circuit. (10 Marks)

### Module-3

- For the Darlington connection, obtain expression for  $A_{i2}$ ,  $R_{i2}$  for II stage and  $A_{i1}$ ,  $R_{i1}$  for I stage. (10 Marks)
  - Consider a 2 stage RC coupled amplifier for the I stage  $R_s = 1 \text{ k}\Omega$ ,  $R_{C1} = 15 \text{ k}\Omega$ ,  $R_{E1} = 100 \Omega$ ,  $R_1 = 200 \text{ k}\Omega$ ,  $R_2 = 20 \text{ k}\Omega$ . For II stage  $R_{C2} = 4 \text{ k}\Omega$ ,  $R_{E2} = 330 \Omega$ , biasing resistors  $R_3 = 47 \text{ k}\Omega$ ,  $R_4 = 4.7 \text{ k}\Omega$ . Bypass capacitor is connected across  $R_{E1}$  and  $R_{E2}$ . Assume  $h_{ie} = 1.2 \text{ k}\Omega$ ,  $h_{fe} = 50$ ,  $h_{oe} = 25 \mu\text{A/V}$ ,  $h_{re} = 2.5 \times 10^{-4}$ , Determine the overall  $A_V$ ,  $A_{VS}$ ,  $R_{o1}'$  and  $R_{o2}'$ . 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 2<sup>nd</sup> 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  $\Omega$ . 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  $C = 0.1$   $\mu$ F. (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  $g_m = g_{m_0} \left( 1 - \frac{V_{GS}}{V_P} \right)$  (05 Marks)

OR

- 10 a. Consider voltage divider bias circuit of JFET. If  $R_D = 1.2$  k $\Omega$ ,  $R_S = 2$  k $\Omega$ ,  $R_1 = 20$  k $\Omega$ ,  $R_2 = 10$  k $\Omega$ ,  $V_{DD} = 12$  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  $R_G = 1$  M $\Omega$ ,  $r_d = 50$  k $\Omega$ ,  $g_m = 2$  m $s^{-1}$ , calculate  $Z_i$ ,  $A_v$  and  $Z_0$ . Draw the circuit diagram  $R_D = 5.1$  k $\Omega$ . (10 Marks)

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