CBCS SCHEME

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17EE34

Third Semester B.E. Degree Examination, Feb./Mar. 2022
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 positive clipper circuit which clipps off positive part of the input above V_R. Draw the waveforms and transfer characteristics. Neglect V_r. **(05 Marks)**

b. For the collector to base bias circuit V_{CC} = 10 V, R_C = 4.7 KΩ, R_B = 220 KΩ and β = 100. Calculate the location of Q-point. **(05 Marks)**

c. For the fixed bias circuit, derive expressions for S_{ICO}, S_{VBE} and S'_β. Also obtain the relations between S_{ICO} and S_{VBE} and S_{ICO} and S_β. **(10 Marks)**

OR

2 a. Calculate the output voltage V_0 for the clamper circuit as shown in Fig.Q2(a). The input voltage V_i is also shown. Frequency V_i = 1 kHz.

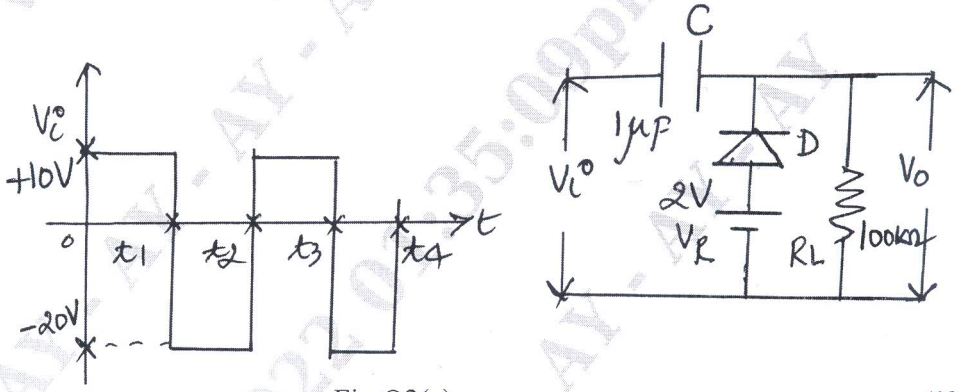

Fig.Q2(a) **(10 Marks)**

b. For the voltage divider bias circuit, derive expressions for S_{VBE}. Also obtain the relation between S_{VBE} and S_{ICO}. **(10 Marks)**

Module-2

3 a. For the transistor amplifier in general form, derive expressions for A_I, Z_i, A_V, A_{VS}, A_{IS} and Z_o. Use h-parameter model. **(10 Marks)**

b. A single stage common emitter amplifier has R_S = 1 KΩ, R_L = 2 KΩ, R_1 = 50 KΩ, R_2 = 2 KΩ, R_C = 2 KΩ, h_{fe} = 50, h_{ie} = 1.1 KΩ, h_{oe} = h_{re} = 0, V_{CC} = 10 V, R_E = 470 Ω, C_E = 47 μF, C_1 = C_2 = 0.01 μF. Draw the circuit diagram and determine A_I, Z_i, A_V, A_{IS} and A_{VS} and Z'_0. **(10 Marks)**

OR

4 a. Explain the working of common collector or emitter follower configuration. Develop expressions for A_I, Z_i, A_V and Y_o using approximate and exact hybrid model. **(10 Marks)**

b. For the amplifier circuit as shown in Fig.Q4(b), $h_{fe} = 100$, $h_{ie} = 3.37$ KΩ, $h_{re} = h_{oe} = 0$. Determine A_I, Z_I, A_V, A_{IS}.

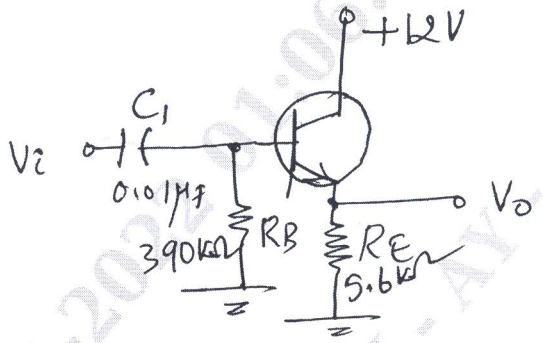

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. Draw the circuit of cascode amplifier. State its merits. Develop h-parameter model using approximate model. **(08 Marks)**

b. Consider a 2-stage RC coupled CE-CE amplifier. The component values are $R_S = 1$ KΩ, $R_{C_1} = 15$ KΩ, $R_{E_1} = 100$ Ω, $R_1 = 200$ KΩ, $R_2 = 20$ KΩ, $C_{E_1} = 47$ μF, $C_1 = C_2 = 0.1$ μF and for II stage $R_{C_2} = 4$ KΩ, $R_{E_2} = 330$ Ω, $C_{E_2} = 47$ μF, $C_1' = C_2' = 0.1$ μF, biasing resistors of II stage, $R_3 = 47$ KΩ and $R_4 = 4.7$ KΩ, $h_{ie} = 1.2$ KΩ, $h_{fe} = 50$, $h_{re} = 2.5 \times 10^{-4}$ and $h_{oe} = 25$ μA/V. Determine the overall A_V, A_{VS} and Z_o. Draw the circuit diagram and small signal circuit. **(12 Marks)**

OR

6 a. For the current series feedback topology, obtain expressions for R_{if} and R'_{of}. **(10 Marks)**

b. For the voltage series feedback circuit of Fig.Q6(b), calculate A_V, β, D, R_i, R_{if}, R_{of} and R'_{of}, $h_{fe} = 50$. Draw the small signal model.

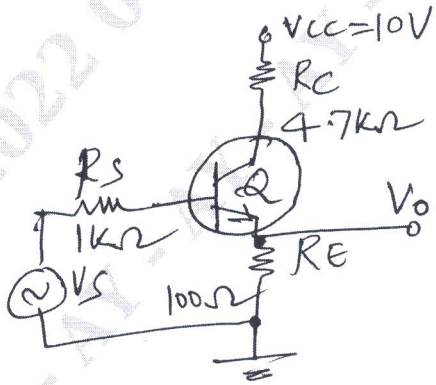

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. For the transformer coupled class-A amplifier, explain DC and AC operations, AC and DC, output and input power efficiency, maximum efficiency and power dissipation. **(10 Marks)**

b. The input signal V_S is given by $V_S = 1.75\sin(600\,t)$ is fed to a power amplifier and regulating o/p current is $i_o = 15\sin 600\,t + 1.5\sin 1200t + 1.2\sin 1800t + 0.5\sin 2400t$. Determine percentage increase in power due to distortion. **(05 Marks)**

c. Explain cross-over distortion in class-B push pull amplifier. **(05 Marks)**

OR

8 a. Explain the expression for gain with feedback in oscillators. What is the value of Aβ to generate oscillations? Thus, explain principle of oscillations. **(06 Marks)**

b. State Barkhausen criteria for sustained oscillations. **(04 Marks)**

c. Derive an expression for frequency of oscillations in Colpitt's oscillator and h_{fe} min required for transistor. **(10 Marks)**

Module-5

9 a. Explain construction of n-channel D-MOSFET. Draw and explain transfer characteristics and drain characteristics. **(10 Marks)**

b. Explain biasing for zero current drift and derive condition for zero drift. **(10 Marks)**

OR

10 a. For the JFET with fixed bias circuit, obtain expressions for Z_i, Z_o, A_V. Compare the result for exact analysis and when $r_d >> R_D$. **(10 Marks)**

b. For the JFET amplifier as in Fig.Q10(b), determine A_V, Z_i, Z_o and Z'_o. For FET, $g_m = 2$ mA/V, $r_d = 10$ KΩ.

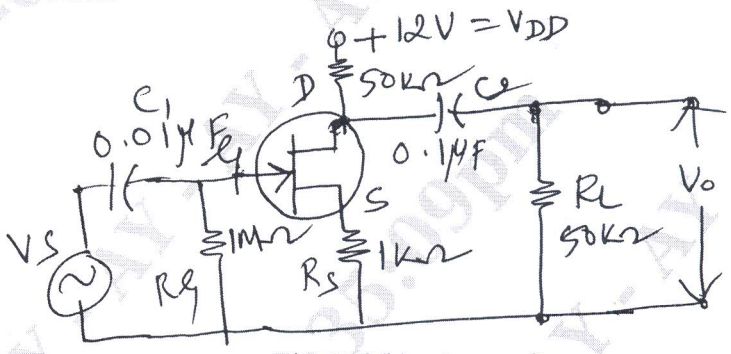

Fig.Q10(b) **(10 Marks)**

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