CBCS SCHEME

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21EC34

Third Semester B.E. Degree Examination, June/July 2024
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 voltage-divider bias circuit. **(06 Marks)**

b. Derive the expression for A_v for the MOSFET amplifier circuit. **(06 Marks)**

c. Design the circuit shown in Fig.Q1(c) to establish $I_D = 0.5$ mA. MOSFET parameters are $V_t = 1V$, $k_n' W/L = 1$ mA/V^2 and $\lambda = 0$.

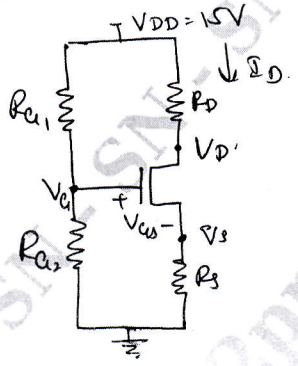

Fig.Q1(c) **(08 Marks)**

OR

2 a. Draw and explain the MOSFET biasing circuit using fixing V_G. **(06 Marks)**

b. Derive the expression for g_m. **(08 Marks)**

c. Consider the amplifier circuit shown in Fig.Q2(c). Let $V_{DD} = 5V$, $V_t = 0.7V$; $\lambda = 0$ and $k_n = 1$ mA/V^2. Find V_{ov} , I_D , R_D and R_G to obtain a voltage gain of 25 and an input resistance of 0.5 MΩ. What is the maximum allowable input signal V_i ? **(06 Marks)**

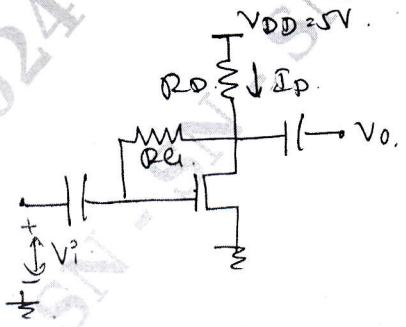

Fig.Q2(c)

Module-2

3 a. Write a note on 3 basic configuration of MOSFET amplifier. Derive the expressions for characterizing parameters of MOSFET amplifier. **(06 Marks)**

b. Draw the high frequency equivalent circuit of a MOSFET and explain the significance of the different elements of the circuit. **(08 Marks)**

c. An amplifier with an input resistance of 100 kΩ an open circuit voltage gain of 100V/V and an output resistance of 100 Ω is connected between a 20 kΩ signal source and a 2 kΩ load. Find the overall voltage gain G_V. **(06 Marks)**

OR

4 a. Derive the expression for characterizing parameters of CS amplifier with source resistance. **(06 Marks)**

b. With a neat diagram, explain the operation of a transistor pierce crystal oscillator. **(08 Marks)**

c. Consider CS amplifier with $I_D = 0.25mA$; $V_{ov} = 0.25$ V, $R_D = 20$ kΩ, $V_A = 50V$, $R_{sig} = 100$ kΩ and $R_L = 20$ K. Find R_{in} , A_{vo} , R_0 , A_o and G_V . If to maintain reasonable linearity the peak of the input sine-wave signal is limited to 10% (2 V_{ov}). What is the peak of the sine wave voltage at the output? **(06 Marks)**

Module-3

5 a. Draw the block diagram of feedback amplifier and discuss the effect of negative feedback with respect to closed loop gain, bandwidth and distortion. **(06 Marks)**

b. How power amplifiers are classified? Discuss them briefly. **(06 Marks)**

c. In an amplifier has a bandwidth of 300 kHz and voltage gain of 100, what will be the new bandwidth and gain if 10% negative feedback is introduced? What will be the gain bandwidth product before and after feedback? What should be the amount of feedback if the bandwidth is to be limited to 800 kHz. **(08 Marks)**

OR

6 a. Explain how negative feedback effects acts on input and output impedance of a circuit. **(06 Marks)**

b. Draw the block diagram of current series feedback amplifier and derive an expression for input resistance, voltage gain and output resistance. **(08 Marks)**

c. Draw the circuit diagram and explain the operation of class B push pull amplifier with relevant waveforms. Show that the maximum conversion efficiency of the class B push pull amplifier is 78.5% **(06 Marks)**

Module-4

7 a. With neat circuit diagram explain the operation of R-2R D/A converter. **(06 Marks)**

b. Draw and explain the working of precision full wave rectifier. **(08 Marks)**

c. Explain the functional block diagram of IC555. **(06 Marks)**

OR

8 a. Write a note on Butterworth approximation. **(06 Marks)**

b. Write a note on monoshot multivibrator using IC555 **(06 Marks)**

c. Design a second order low pass Butterworth filter having high cutoff frequency of 1 kHz. Draw its frequency response. **(08 Marks)**

Module-5

9 a. Define power Electronics and brief its applications. **(06 Marks)**

b. Explain power electronics converters. **(08 Marks)**

c. Explain silicon controlled Rectifier with its characteristics. **(06 Marks)**

OR

10 a. Explain turn on and turn off methods of SCR. **(06 Marks)**

b. Explain gate triggering circuit of RC firing circuit with necessary diagram. **(06 Marks)**

c. With neat waveform and circuit diagram, explain UJT firing circuit. **(08 Marks)**

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