CBCS SCHEME

USN | | | | | | | | | | |

21EC34

Third Semester B.E. Degree Examination, Dec.2023/Jan.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 biasing of BJT by collector to base feedback resistor for a CE amplifier. **(08 Marks)**

b. A BJT having $\beta = 100$ is biased at a DC collector current of 1 mA. Find the value of g_m, r_e, r_π at the bias point. Assume $V_T = \frac{1}{40}V$. **(04 Marks)**

c. Draw the small signal equivalent circuit model for MOSFET and obtain the expression for voltage gain. **(08 Marks)**

OR

2 a. Explain biasing of MOSFET using drain to gate feedback resistor. **(06 Marks)**

b. What is transconductance of a MOSFET and mention the three different expression used to calculate the g_m. **(06 Marks)**

c. For the circuit shown in Fig. Q2 (c), find the required value of V_{GS} to establish a dc bias current $I_D = 0.5$ mA. Device parameters are $V_t = 1$ V, $K_n' \frac{\omega}{L} = 1$ mA/V^2 and $\lambda = 0$. What is the percentage change in I_D obtained when the transistor is replaced with another having $V_t = 1.5$ V. **(08 Marks)**

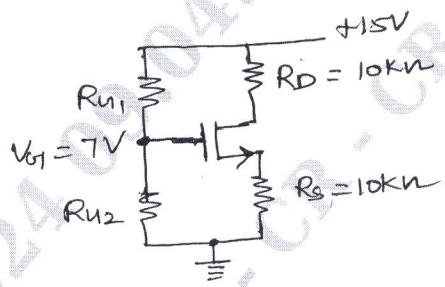

Fig. Q2 (c)

Module-2

3 a. With mathematical equations, explain the different internal capacitances in the MOSFET. **(10 Marks)**

b. Explain the high frequency response of a CS amplifier using MOSFET and derive its upper cut off frequency. **(10 Marks)**

OR

4 a. Draw the circuit of a RC phase shift oscillator using MOSFET and explain the working. **(06 Marks)**

b. A 2 MHz quartz crystal is specified to have L = 0.52 H, $C_S = 0.012$ PF, $C_P = 4$ PF and R = 120 Ω. Find f_s, f_P. **(04 Marks)**

c. Derive the expression of R_{in}, R_O, A_{VO} and A_V using T model for the common source amplifier with a source resistance circuit. **(10 Marks)**

Module-3

5 a. What are the properties of negative feedback and explain it briefly. **(10 Marks)**

b. What are the topologies of basic feedback circuit? **(04 Marks)**

c. For the block diagram, shown in Fig. Q5 (c), a signal of 1 V from the source results in a difference signal of 10 mV being provided to the amplifier (A) and 10 V applied to the load. For this arrangement identify the value of A and β that apply. **(06 Marks)**

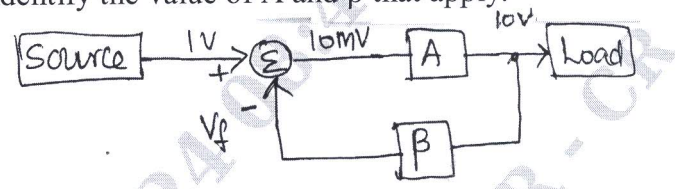

Fig. Q5 (c)

OR

6 a. Draw the circuit of a transformer coupled class-A power amplifier. Prove that the maximum conversion efficiency is 50%. **(08 Marks)**

b. What is output stage and discuss the classification of output stages based on the collector current? **(06 Marks)**

c. Neatly draw the schematic diagram of class C tuned amplifier and discuss the input and output waveforms at the collector terminal. **(06 Marks)**

Module-4

7 a. Derive the expression of output voltage and explain the operation of 4-bit DAC using R-2R circuit. **(10 Marks)**

b. What is meant by precision rectification? Explain with a neat circuit diagram, the working of a small signal half wave precision rectifier using Op-Amp. **(10 Marks)**

OR

8 a. With the help of a neat circuit diagram and relevant waveforms, explain the working of astable multivibrator circuit operation using 555 timer IC. Derive expression for T_{ON}, T_{OFF} and T. **(10 Marks)**

b. Explain the working of a second order lowpass butterworth filter. Write the design equations. Design the circuit for cut off frequency of 1 kHz. **(10 Marks)**

Module-5

9 a. With the help of the static V-I characteristics, explainthe three modes of operation of the thyristor. **(10 Marks)**

b. Explain the working of a UJT firing circuit using SCR with necessary circuit diagram and waveforms. **(10 Marks)**

OR

10 a. Discuss various power converter circuits with necessary sketches and applications of each. **(08 Marks)**

b. List different turn on methods, explain all in brief. **(08 Marks)**

c. Enumerate the applications of power electronics. **(04 Marks)**

* * * * *