CBCS SCHEME

USN

18EC42

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Analog Circuits

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Mention and explain the design issues of a classical biasing for BJT using collector-to-base feedback resistor and which uses single power supply. **(10 Marks)**

b. Design classical bias network of amplifier to establish a current $I_E = 1$ mA using a power supply $V_{CC} = +12$ V and transistor has $\beta = 100$. **(10 Marks)**

OR

2 a. Explain the design of biasing technique for discrete MOSFET by fixing V_G and connecting a resistance in source and drain-to-Gate feedback resistor. **(10 Marks)**

b. Determine voltage gain of transistor amplifier for the circuit shown in Fig.Q2(b). Assume $\beta = 100$.

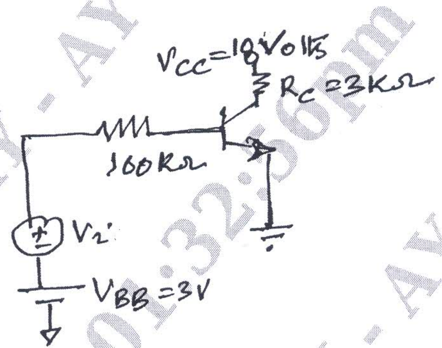

Fig.Q2(b) **(10 Marks)**

Module-2

3 a. Deduce and expression for upper cut off frequency of MOSFET – common source amplifier. **(10 Marks)**

b. Find the mid band gain A_M and the upper 3-dB frequency f_H of a CS amplifier fed with a signal source having an internal resistance $R_{sig} = 100$ KΩ. The amplifier has $R_G = 4.7$ MΩ, $R_D = R_L = 15$ KΩ, $g_m = 1$ mA/V, $r_0 = 150$ KΩ, $C_{gs} = 1$ PF and $C_{gd} = 0.4$ pf. **(10 Marks)**

OR

4 a. With a neat circuit diagram, explain the operation of FET based phase shift oscillator. **(10 Marks)**

b. With a neat circuit diagram, explain the operation of crystal oscillator along with relevant equation for frequency of oscillation. **(10 Marks)**

Module-3

5 a. Discuss the properties of negative feedback. **(10 Marks)**

b. Using ideal structure and equivalent circuit. Deduce an expression for input and output resistance of:
(i) Series shunt feedback amplifiers
(ii) Shunt-shunt configuration **(10 Marks)**

OR

6 a. Derive an expression efficiency of class C power amplifier. **(10 Marks)**

b. Deduce an expression for output resistance by discussing the circuit operation of class AB output stage. **(10 Marks)**

Module-4

7 a. For a practical inverting amplifier the values of R_1 and R_f are 470 Ω and 4.7 KΩ. The various specifications for opamp used are:

Open loop gain = 2×10^5

Input resistance = 2 MΩ

Output resistance = 75 Ω

Single break frequency = 5 Hz

Supply voltages = ±15V

Calculate closed loop voltage gain, i/p and o/p resistance and bandwidth with feedback. **(10 Marks)**

b. Mention and explain the requirements of a good instrumentation amplifier and analyze three opamp instrumentation amplifier. **(10 Marks)**

OR

8 a. Design an opamp Schmitt trigger with following specifications UTP = 2V, LTP = –4V and the output swings between ±10V. If the input is $5\sin\omega t$, plot the waveforms of input and output. **(10 Marks)**

b. Discussing the circuit operation of (i) DC amplifiers (ii) AC amplifiers, using OPAMPS. **(10 Marks)**

Module-5

9 a. Explain the circuit operation of monoshot using IC555. Derive the expression of pulse width. **(10 Marks)**

b. For the circuit shown in Fig.Q9(b), determine the lower cutoff frequency and then plot the frequency response of fitter.

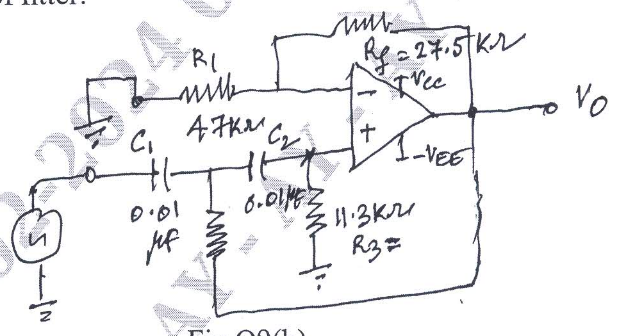

Fig.Q9(b) **(10 Marks)**

OR

10 a. Discuss the circuit operation of Astable multivibrator using IC555. Derive an expression for frequency of oscillations. **(10 Marks)**

b. Discuss the working of successive approximation ADC. **(10 Marks)**

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