CBCS SCHEME

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17EE34

Third Semester B.E. Degree Examination, July/August 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. Determine the Output voltage waveform for the circuit shown below in Fig. Q1(a): **(06 Marks)**

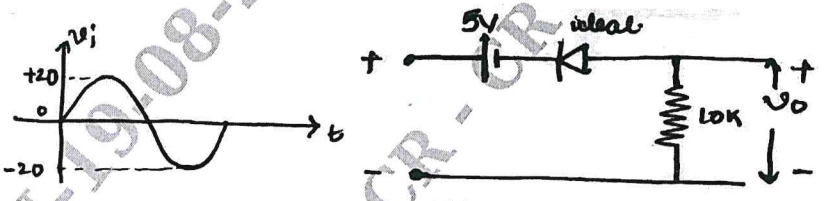

Fig.Q1(a)

b. Sketch the Output waveform for the following input.

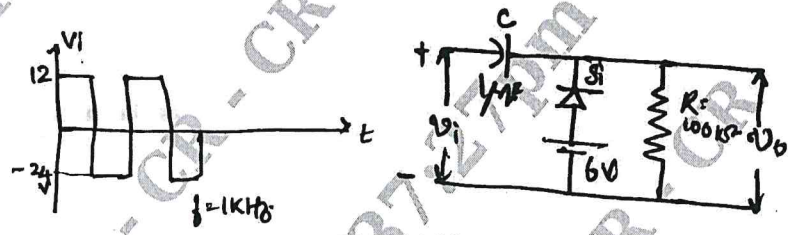

Fig. Q1(b) **(07 Marks)**

c. For the circuit shown in Fig. Q1(c), find i) I_C ii) V_{CC} iii) β iv) R_B. Assume $V_{BE} = 0.7V$. Given $I_B = 20\mu A$ and $I_C = 4mA$. **(07 Marks)**

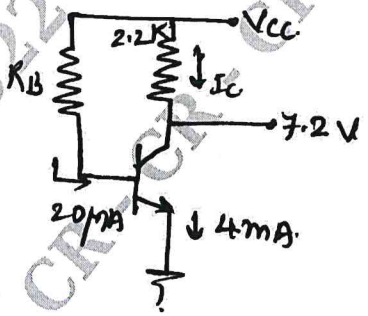

Fig. Q1(c)

OR

2 a. Describe the operation of a transistor as a bistable switch. **(05 Marks)**

b. Derive an expression for stability factor for a fixed bias circuit for the following :
i) $S(V_{BE})$ ii) $S(\beta)$ iii) $S(I_{CO})$ **(07 Marks)**

c. Derive an expression for a voltage divider bias circuit :
i) I_B ii) V_B, using exact analysis. **(08 Marks)**

Module-2

3 a. Derive an expression for i) Input impedance (Zi) ii) Output impedance (Zo) iii) Voltage gain (AV) iv) Current gain (Ai) for common emitter fixed bias configuration using hybrid π model. **(10 Marks)**

b. A voltage source of negligible internal reactance driver a common collector transistor amplifier. The load resistance is 2500 Ω. The transistor h – parameter are h_{ic} = 1000 Ω , h_{rc} = 1 , h_{fc} = -50 , h_{oc} = 25 μA/v. Compute Ai, Av, Zi and Zo **(10 Marks)**

OR

4 a. Derive an expression to verify Miller effect capacitance. **(10 Marks)**

b. Derive an expression for i) Z_i ii) Z_o iii) A_V iv) A_i for a collector feedback configuration. **(10 Marks)**

Module-3

5 a. For the BJT cascade amplifier shown below in Fig. Q5(a) :

i) Calculate the DC bias voltages and collector current for each stage.

ii) Calculate the Voltage gain of each stage , the overall voltage gain and the output voltage.

iii) Repeat part (ii) with a load of 10k Ω load applied to the 2nd stage.

iv) Calculate the input impedance of the 1st stage and the output impedance of the 2nd stage. Take β = 200 for both transistor. **(10 Marks)**

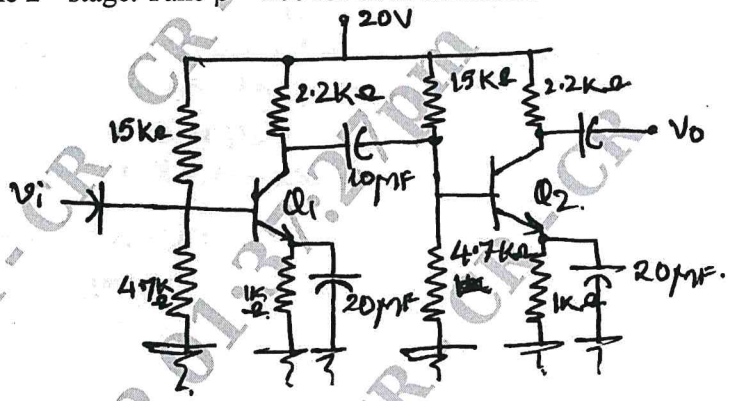

Fig. Q5(a)

b. For the cascaded arrangement shown in Fig Q5(b), calculate :

i) The loaded voltage gain of each stage

ii) The total gain of the system A_V and A_{V1}

iii) The loaded current gain of each stage

iv) The total current gain of the system.

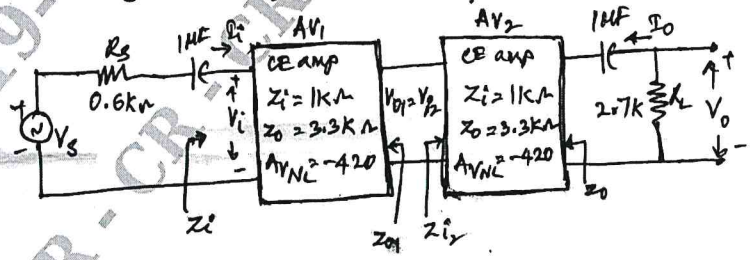

Fig Q5(b)

(10 Marks)

OR

6 a. With a neat diagram, explain 4 different feedback amplifier topologies. **(08 Marks)**

b. Define the general characteristics of negative feedback amplifier with appropriate mathematical formulations. **(04 Marks)**

c. An amplifier has a open loop voltage gain A = 1000 ± 100. It is required to have an amplifier whose voltage gain varies by no more than ± 0.1%.

i) Find the reverse transmission factor β of feedback network used.

ii) Find the gain g with feedback. **(08 Marks)**

Module-4

7 a. Explain the classification of power amplifiers, with a neat waveform. **(08 Marks)**

b. Derive an expression for output power (P_{oac}) for a transformer coupled class A power amplifier with relevant waveforms. **(12 Marks)**

OR

8 a. A crystal has the following parameters L = 0.334H , C = 0.065 pF ; Cm = 1 pF ; R = 5.5kΩ.

i) Calculate the series resonant frequency.

ii) Calculate the parallel resonant frequency.

iii) By what % does the parallel resonant frequency exceed the series resonant frequency?

iv) Find the Q of the crystal. **(10 Marks)**

b. Derive an expression for :

i) Frequency of oscillation.

ii) Conditions for sustained oscillations for a Wein Bridge oscillator. **(10 Marks)**

Module-5

9 a. Explain the construction and characteristics of JFET's , with a neat diagram and characteristic waveform. **(13 Marks)**

b. Briefly explain the Transfer characteristics of a JFET, with suitable equations. **(07 Marks)**

OR

10 a. Explain the construction and characteristics of enhancement type MOSFET with relevant waveforms and appropriate diagram. **(14 Marks)**

b. Derive an expression to show the relationship between I_D and g_m. **(06 Marks)**

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