Registration No.: | | | | | | | | | | |

Total Number of Pages: 03 **Course: B.Tech**

Sub_Code: RCI4G003/RCS4G001/REC3C001

4th Semester Back Examination: 2024-25

SUBJECT: Analog Electronic Circuits

BRANCH(S): C&EE, CIVIL,CSE, CSEAIML, CSEDS, ELECTRICAL & C.E

Time: 3 Hours

Max Marks: 100

Q.Code: S230

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Differentiate between BJT and FET. Explain, how FET is unipolar though both of the electrons and holes are responsible for flow of current in a semiconductor device?

b) Discuss about load line and operating point.

c) What is model of a circuit? Draw and briefly explain, how the *re* model of CE configuration is obtained.

d) Draw and explain the small signal model of a FET.

e) Draw the high Frequency equivalent model of a BJT. How many Miller effect capacitances are there? Name them.

f) Explain in brief, the frequency response of a CE amplifier circuit.

g) Draw and explain a practical series voltage feedback Circuit.

h) State the Barkhausen criterion for sustained oscillations. Write a brief note on sinusoidal oscillators

i) Differentiate between an ideal Op-Amp and a practical Op-Amp.

j) What is the necessity of an instrumentation amplifier? Draw its circuit diagram.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Draw the V-I Characteristics and explain the principle of operation of an E-MOSFET

b) Find the high frequency response parameters of CS-amplifier with source resistance.

c) With suitable circuit diagrams and explanation, derive the equations for input and output miller capacitances.

d) What is an oscillator? Name different types of oscillators. Find the feedback factors β and A of a Wien bridge oscillator circuit and explain its operation.

e) Why power amplifiers are named so? Write all about a class-A amplifier.

f) Explain about applications of one inverting and two non-inverting Configurations of OP-AMP circuits.

g) Write a note on differential amplifier circuit.

h)

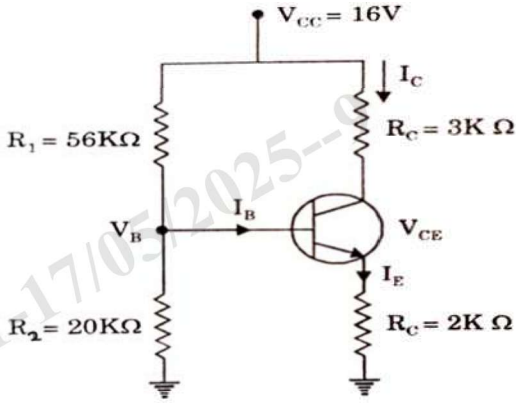

Fig. 1

How a voltage divider biasing circuit is different from a basic self-bias circuit? With the transistor **α** = 0.982 in a CE germanium transistor amplifier circuit shown in Fig. 1, determine the operating point and the stability factor ***S*** of it.

i) Is anywhere fixed biasing practically used? If not, why we study about it? For a fixed bias circuit having V_{CC} = 12 V, R_C = 4 KΩ, β = 150, operated with 10 mV source find I_C, R_B if V_{CE} = 7 V.

j) What do you mean by frequency response? Draw and explain each region associated to the frequency response of a BJT.

k) Discuss the effects of R_{sig} and R_L on CS Amplifier circuit.

l) Explain in brief, which configuration arises in an emitter follower circuit.

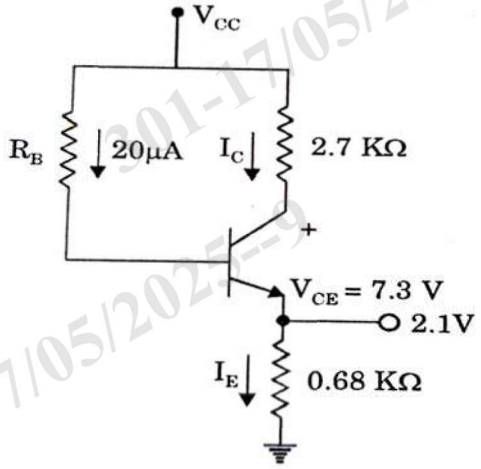

Fig. 2

Find the value of β, VCC, and RB of the emitter follower circuit shown in Fig. 2.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 Discuss the need of biasing for a BJT or FET and explain, why load line is named so? Extend your discussion on fixed bias, self-bias, and voltage divider bias configurations related to FET/MOSFET. **(16)**

Q4 Name the capacitors that affects the low and high frequency responses of a BJT amplifier circuit. In case of high frequency response which one is more dominating? Determine the high cut-off frequencies for a CS network using the following parameters: **(16)**
V_{DD} = 20V, V_P = –4V, signal resistance R_{sig} = 10 KΩ, R_D = 4.7 KΩ, I_{DSS} = 8mA, r_d = ∞, C_G = 0.01 μF, R_G = 1 MΩ, coupling capacitor C_C = 0.5 μF, R_S = 1 KΩ, C_S = 2 μF, parasitic capacitances C_{gd} = 2 pF, C_{gs} = 4 pF, and C_{ds} = 0.5 pF, wiring capacitances C_{wi} = 5 pF and C_{wo} = 6 pF, R_L = 2.2 KΩ.

Q5 What is a cascaded RC-coupled amplifier circuit? How is it different from Darlington connection and current mirror circuits. What are the advantages of this amplifier? With suitable circuit diagram, explain the principle of operation of a RC-phase shift oscillator and find the expression for frequency of oscillation. **(16)**

Q6 What are common mode and differential mode inputs to an Op-Amp. Discuss the various parameters such as CMRR, DC offset, slew rate related to Op-Amp. Calculate the value of R as if the gains in two modes (inverting or non-inverting) are equal. **(16)**