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Total Number of Pages : 02

Course: B.Tech

Sub Code: RCI4G003, RCS4G001, REC3C001

4th Semester Regular / Back Examination: 2022-23

SUBJECT: Analog Electronic Circuits

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

Time: 3 Hour

Max Marks : 100

Q.Code : M410

Answer Question No.1 (Part-1) 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)

- Define Q Point of BJT.
- Calculate β for two transistors for which $\alpha = 0.99$ and 0.98 . For collector currents of 10 mA, find the base current of each transistor.
- What is the use of level transistors?
- Why at high frequencies the gain of the amplifier reduces?
- Define Pinch off Voltage of FET.
- List the Barkhausen criteria for sustained oscillation.
- What is harmonic distortion?
- What is the advantage of using a current mirror circuit?
- It is desirable to have high input impedance for a transistor amplifier, why?
- What are the important features of differential amplifier?

Part-II

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

- Derive the expression for Stability Factor S of a Fixed Bias Circuit.
- Calculate the value of g_m for a BJT biased at $I_C = 0.5$ mA.
- Find the output resistance of a BJT for which $V_A = 100$ V at $I_C = 0.1, 1,$ and 10 mA.
- What is Base width modulation? Discuss its impact on output impedance of Amplifier
- Show that total gain is equal to the product of gains of individual stages in a multi-stage amplifier.
- Mention the differences between depletion and enhancement MOSFET.
- With a neat circuit diagram, explain the operation of BJT Crystal oscillator.
- For an emitter follower circuit compute Z_i, Z_o, A_v and A_L .
- Construct and label an inverting amplifier circuit for a voltage gain of 10 .

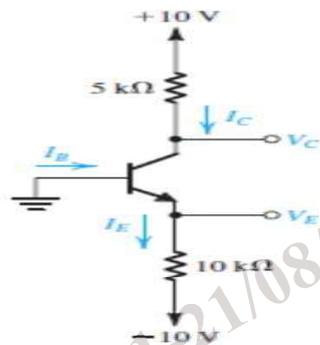
- j) A particular n -channel MOSFET is measured to have a drain current of 0.4 mA at $V_{GS} = V_{DS} = 1$ V and of 0.1 mA at $V_{GS} = V_{DS} = 0.8$ V. What are the values of k_n and V_t for this device?
- k) Show that gain of an inverting amplifier is $-R_f/R_i$.
- l) Why is FET called unipolar device? List the features of FET.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 (a) Draw and explain the small signal model of FET at low frequency. (08)
- (b) The input power to a device is 10,000 W at a voltage of 1000 V. The output power is 500 W and the output impedance is 20Ω i) Find power gain in decibels ii) Find the voltage gain in decibels iii) Find input impedance. (08)

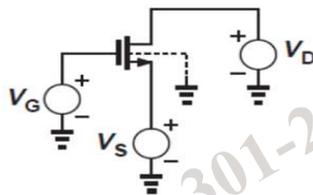
- Q4 (a) (10)



In the circuit shown above, the voltage at the emitter was measured and found to be -0.7 V. If $\beta = 50$, find I_E , I_B , I_C , and V_C .

- (b) Describe the working of class-AB amplifier. (06)
- Q5 (a) What is the effect of internal transistor capacitances on the bandwidth of the amplifier? Explain in detail. (08)
- (b) Explain the need for an operation of instrumentation amplifier. (08)

- Q6 (a) (10)



For the above circuit assume $V_S = 0.5$ V, $V_G = V_D = 1.4$ V, $\mu_n C_{ox} = 100 \mu\text{A}/\text{V}^2$, $W/L = 50$, and $V_{TH} = 0.6$ V. Determine the drain current if $\lambda = 0$

- (b) Explain the importance of negative feedback required for Amplifier and list out the advantages of it. (06)