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Total Number of Pages:02

Integrated Dual Degree (B.Tech and M.Tech)

Sub_Code: 23ES1002

2nd Semester Regular Examination: 2023-24

SUBJECT: BASIC ELECTRONICS

BRANCH(S): AEIE,AUTO,BIOTECH,CE,CHEM,CIVIL,CSE,CSEAI,CSEAIME, CSEDS,CST, ECE,EEE,ELECTRICAL, ETC,MANUTECH,MECH,METTA,MINERAL,MME,PLASTIC

Time: 3 Hour

Max Marks: 100

Q.Code: P373

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)

- What is drift current in a semiconductor?
- Determine the DC resistance of a diode at $V_D = -10V$ if its reverse saturation current is $1\mu A$ ($V_T = 25mV$ at room temperature)
- What is DC load line? How is Q point plotted on the DC load line?
- Why FET is called as a voltage-controlled device?
- What is the β value of a BJT for $\alpha = 0.99$?
- What is negative feedback? What is its use in amplifier?
- Define CMRR. An OPAMP has common mode gain of 0.01 and differential mode gain of 10^5 . Find its CMRR in decibel.
- Convert the numbers: $(475.25)_8 = (\underline{\hspace{1cm}})_{10}$ and $(AE.2B)_{16} = (\underline{\hspace{1cm}})_8$
- Prove the Boolean Identity, $(A+B)(A+C) = A + BC$.
- What is Frequency modulation and write its application in real scenario?

Part-II

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

- Determine V_o , I_1 , I_{D1} , and I_{D2} for the parallel diode configuration as in Fig. 1.

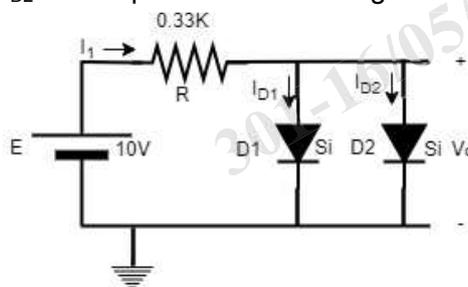


Fig. 1

- Explain the operation of bridge type full wave rectifier circuit with waveforms.

- c) In a fixed bias Silicon n-p-n transistor (CE) circuit with $\beta = 120$, $V_{CC} = +16V$, $R_C = 1.8K\Omega$, $R_B = 510K\Omega$ are used. Find $I_{B,Q}$, $I_{C,Q}$, $V_{CE,Q}$, V_C , V_B , and V_E .
- d) Define pinch off voltage with respect to different characteristics of an n-channel JFET? When V_{GS} of JFET changes from $-3.1 V$ to $-3 V$, the drain current changes from $1 mA$ to $1.3 mA$. What is the value of transconductance?
- e) Explain the steps to be followed for the fabrication of monolithic IC.
- f) Write the difference between D-MOSFET and E-MOSFET with characteristics curve.
- g) Write the difference between Zener breakdown and avalanche Breakdown.
- h) Perform $(26)_{10} + (13)_{10}$ in binary. Find the 1's and 2's complement of the binary number $(1011)_2$.
- i) In a negative feedback system, gain without feedback is $60dB$. It decreases to $40dB$ with feedback. Calculate the feedback factor.
- j) List the four basic feedback topologies. Draw the voltage series feedback circuit and current series feedback circuit.
- k) Explain the working principle of DSO with neat diagram.
- l) Define modulation. Explain the AM modulation with block diagram.

Part-III

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

- Q3 Explain the physical structure, operation, and characteristics of n-channel Enhancement MOSFET. (16)
- Q4 a) Explain the operation of Op-amp as non-inverting amplifier. Find the close loop gain of the non-inverting amplifier circuit. (8)
- b) Find the output voltage of the following Summing Amplifier circuit as in Fig. 2. (8)

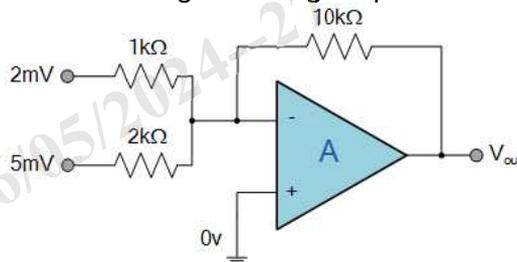


Fig. 2

- Q5 Given Boolean expression $X = \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C$ (16)
 - (a) Obtain the truth table of function X
 - (b) Draw the logic diagram, using original Boolean expression
 - (c) Use Boolean algebra to simplify the function to a minimum number of literals.
 - (d) Draw the logic diagram, from the simplified expressions.
- Q6 Define modulation. Explain the difference between amplitude modulation and frequency modulation with equation and waveform. (16)