Registration No.: ☐☐☐☐☐☐☐☐☐☐

Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: 23ES1002

1st Semester Regular/Back Examination: 2025-26
SUBJECT: BASIC ELECTRONICS

BRANCH(S): AE, AEIE, AERO, AIML, AUTO, BIOTECH, CHEM, CIVIL, CS, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MECH, METTA, MINERAL, MINING, MME
Time: 3 Hours
Max Marks: 100
Q.Code: U728
Answer Q1 (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) Mention few properties of semiconductor.
b) What do you understand by depletion region? How it is formed in a diode?
c) Define leakage current in CB configuration.
d) Compare between a BJT and a JFET.
e) What type of gate voltage is necessary in an n-channel D-MOSFET and n-channel E-MOSFET to cause current flow?
f) What is the significance of the term “monolithic IC”?
g) Define slew rate in connection with an OP-AMP.
h) Add the binary numbers 10111 and 111.
i) Represent $(-5)_{10}$ in sign magnitude and 1’s complement form.
j) Implement NOT using NAND.

Part-II

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

a) For a transistor, $I_C = 7$ mA, $I_{CO} = 25$ μA and $I_B = 0.1$ mA. Calculate α, β, and I_E.
b) Draw the CB output characteristics of a transistor. Answer the followings.
(i) Indicate all region of operation
(ii) mention biasing and current expressions
c) With neat sketch, describe the operation of a center-tapped FWR.
d) The reverse saturation current at 300 K of a p-n junction Ge diode is 5 μA. Find the voltage to be applied across the junction to obtain a forward current of 50 mA.
e) Mention the relationship between V_{GS}, V_P, and $V_{D,Sat}$. An n-channel JFET has the following parameters: $I_{DSS} = 10$ mA and $V_P = -4$V. If $V_{GS} = -2.5$ V, find the drain current?
f) State the limitations of integrated circuits.

g) Mention characteristics of ideal OP-AMP. Discuss the concept of virtual ground in OP-AMP circuits and explain its significance in circuit analysis.

h) Is negative feedback reducing the gain of an amplifier? Justify your answer with suitable block diagram.

i) Convert the followings:

i) $(FACE)_{16} = (?)_{10}$
ii) $(15.45)_{10} = (?)_{2}$
iii) $(101011011011.1101)_{2} = (?)_{8}$

j) Simplify the following Boolean expressions.

(i) $Y(A,B,C,D) = A\bar{C} + \bar{B}D + \bar{A}CD + ABCD$
(ii) $Y(A,B,C) = (\overline{A+B})(\bar{A}+\bar{C})(\bar{B}+\bar{C})$

k) Differentiate between conventional CRO and DSO.

l) What is amplitude modulation? Obtain an expression for an AM wave with sinusoidal modulation.

Part-III

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

Q3 Describe the forward bias and reverse bias operation of p-n junction diode using suitable diagrams. Draw the characteristics curve. **(16)**

Q4 With a neat sketch, explain the construction and principle of operation of p-channel D-MOSFET. **(16)**

Q5 With suitable diagram, describe the use of an OP-AMP as subtractor. **(16)**

Q6 Draw the block diagram of a DSO. Explain the function of each block. **(16)**