GALGOTIAS UNIVERSITY

ADMISSION NUMBER												

School of Basic Sciences

Bachelor of Science Honours in Mathematics
Semester End Examination - May 2024

Duration : 180 Minutes
Max Marks : 100

Sem VI - C1UD604B - Analog and Digital Principles and Applications

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

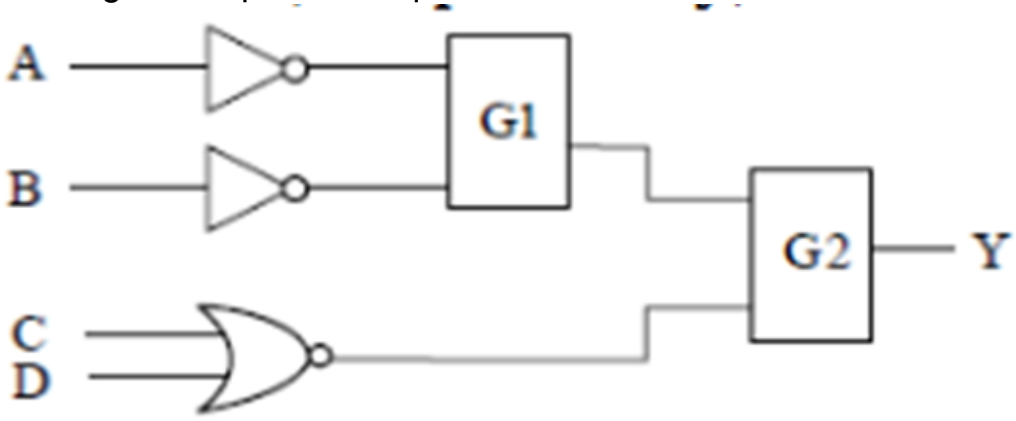
1) Design the Ex-OR gate using NAND gates. K1 (3)

2) Write the expression for function Y in SOP & POS forms. K2 (4)

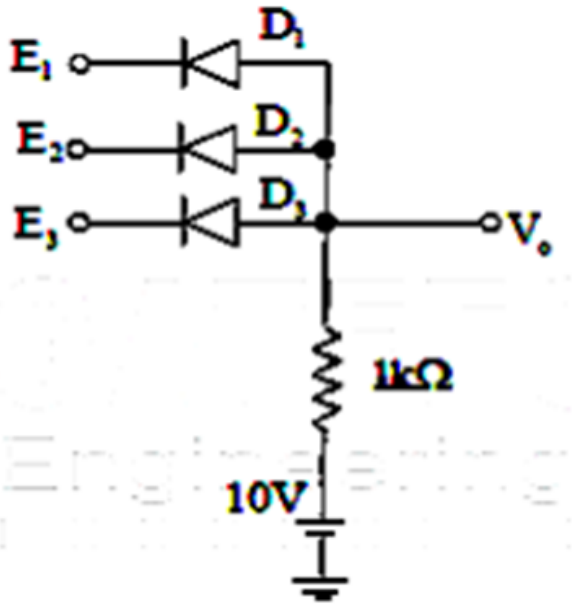
B	C	Y
0	0	0
0	1	1
1	0	0
1	1	1

3) Explain the nature of Fermi-Dirac distribution function and interpret it graphically at different temperatures. K2 (6)

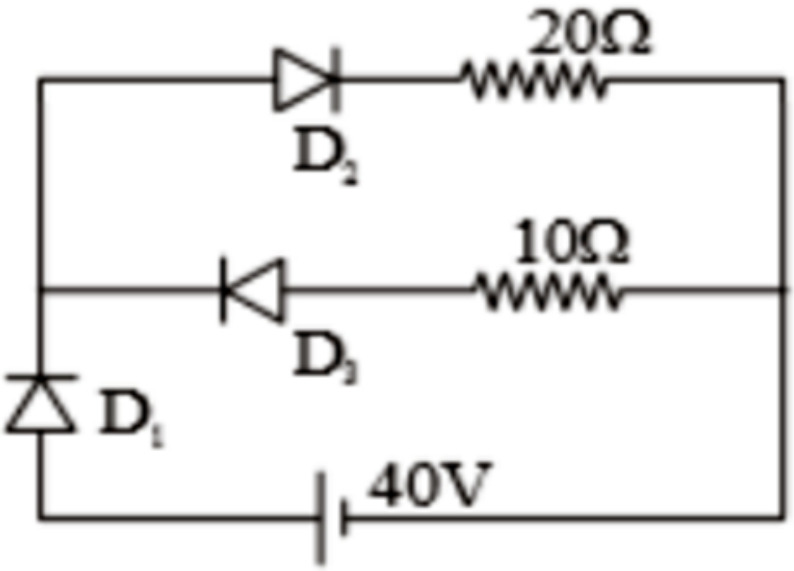
4) Indentify the name of logic gates at G1 and G2 in the given circuit considering the output Y is required to be $Y = AB + \overline{CD}$ K3 (6)



5) Write the name of logic gate of given circuit shown, diodes $D_1, D_2, \text{ and } D_3$ are ideal, and the inputs $E_1, E_2 \text{ and } E_3$ K3 (6)



6) Three ideal diodes are connected to the battery as shown in the circuit. Find the current supplied by the battery (see Fig.). If the polarity of the battery is reversed, then calculate the current in same circuit. K3 (9)



7) Simply the following Boolean functions using K –Map F(A,B,C,D.E) = Σ (0,2,4,6,9,11,13,15,17,21,25,27,29,31) K3 (9)

8) Write the truth table of full adder and draw the full adder diagram using NAND gates? K4 (8)

9) Explain with logic diagram of 4-bit serial-in, parallel-out, shift register K4 (12)

10) Design a Full – Adder using two Half - Adder and OR gate, draw the Block diagram with logic circuit ? K5 (10)

11) Find the resistance of an intrinsic Ge rod 1 mm long, 1 mm wide and 1 mm thick at 300 K. the intrinsic carrier density $2.5\ X\ 10^{19} m^{-3}$ is at 300 K and the mobility of electron and hole are $0.39\ and\ 0.19\ m^2 v^{-1} s^{-1}$. K5 (15)

OR

Germanium has a donor type of impurity added to the extent of one atom per 108 germanium atoms. What effect does this have on the conductivity of the material at 27°C? Given: $\mu_e = 0.39 m^2 V^{-1} s^{-1} and\ \mu_p = 0.19 m^2 V^{-1} s^{-1}$ of intrinsic germanium. Electron mobility of the doped germanium is $0.38\ m^2 V^{-1} s^{-1}$. Given: $K_B = 1.38\ X\ 10^{-23} J/k, h = 6.626 x 10^{-34} J - s\ and\ m_0 = 9.1\ X\ 10^{-31} kg.$ K5 (15)

12) Design SR flip-flop using JK flip-flop. K6 (12)

OR

N number of Ex-NOR gates are connected as show in figure. How does this circuit work? Explain? K6 (12)