[This question paper contains 2 printed pages]

Your Roll No …….

Sr. No. of Question Paper	: **6497**
Unique Paper Code	:2514001201
Name of the Course	: Digital System Design
Name of the Paper	**: B.Sc. (Hons.) Electronics – General Elective (GE)**
Semester	: II
Duration	: 3.0 Hours
Maximum Marks	: 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. **First** Question is Compulsory.
4. Use of Scientific non-programmable calculator is allowed.

1. (a) Find 2's complement of binary number 10110010.
   (b) Convert the decimal number 9673 to BCD.
   (c) What are the applications of Gray Code?
   (d) Develop the truth table for a 3-input AND gate.
   (e) Distinguish between a Combinational and Sequential logic.
   (f) Explain the difference between synchronous and asynchronous counters. What is meant by modulus of a counter?

(3x6=18)

2. (a) Express the decimal number –25 as an 8-bit number in:-
   (i) sign-magnitude form
   (ii) 1's complement form
   (iii) 2's complement form
   (b) Construct OR and EX-OR gates using NAND gates.
   (c) Convert octal number 623.77 into equivalent:-
   (i) decimal number
   (ii) hexadecimal number
   (iii) binary number

(6+6+6)

3. (a) Simplify below Boolean function using K-map and realize using logic gates:-
   $f(A, B, C, D) = \Sigma m\ (0,1,2,4,6,8,10,12,13,14,15)$
   (b) Develop a truth table for the standard SOP expression:-
   $\bar{A}\bar{B}C + A\bar{B}\bar{C} + ABC$
   (c) Describe derived logic gates (NAND, NOR, XOR, XNOR) and explain the universal property of NAND and NOR gates.

(6+6+6)

4. (a) Using Boolean algebraic techniques, simplify the following expression and implement using logic gates:-
   $Y = AB\bar{C}\bar{D} + \bar{A}B\bar{C}\bar{D} + \bar{A}BC\bar{D} + ABC\bar{D}$
   (b) Perform the following operations:-
   (i) Convert the decimal number 2469_{10} to BCD
   (ii) Convert the hexadecimal number $CF8E_{16}$ to binary number
   (c) Prove the Boolean algebraic theorem using truth table approach
   $\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC = AB + BC + CA$

(6+6+6)

5. (a) What are Half Adder and Full Adder? Give Circuits for both using basic gates.
   (b) Implement a Full Adder using 3 to 8 decoder and logic gates.
   (c) What is meant by Encoder? Design and explain an octal to binary Encoder using OR gates.

(6+6+6)

6. (a) Write down VHDL program for a 3 to 8 line Decoder.
   (b) Explain briefly BCD to seven-segment Decoder.
   (c) What is meant by Edge Triggering? Differentiate between a positive and negative edge triggered Flip-Flop giving suitable example.

(6+6+6)

7. (a) Draw circuit of a SR Flip-Flop using NAND gates. Give its Truth Table and explain its working. How can you convert an SR Flip Flop to a D Flip-Flop?
   (b) Design a decade asynchronous Counter and explain its working with timing diagram.
   (c) With logic diagram, explain working of a 4-bit Serial In -Serial Out Shift Register.

(6+6+6)