Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Odd) Semester Examination December 2024

Roll no 24920001

Name of the Course and semester: BCA / 3rd Sem
Name of the Paper: Digital Logic Design
Paper Code: TBC 303
Time: 3 hour

Maximum Marks: 100

Note:
(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1. (2X10=20 Marks) (CO 1)

a. Perform various conversion:
   i. $(20A4.95)_{16} = (\quad)_8$
   ii. $(1145.86)_8 = (\quad)_{16}$
   iii. $(72.22)_8 = (\quad)_{10}$
   iv. $(1449.44)_{10} = (\quad)_2$

b. Realize the AND, OR, NOT and EX-OR Gate using NAND gate only.

c. Explain 1 s and 2 s complement method. Find out the subtraction of given numbers by 2 s complement method, i. $(1010)_2 - (0111)_2$ and ii. $(0101)_2 \quad (1100)_2$

Q2. (2X10=20 Marks) (CO 2)

a. Explain and prove De Morgan s theorem using example. Also define Associative and Distributive Laws with example.

b. Perform the minimization of given function using k-map,
$f(A, B, C, D) = \sum m(1,3,7,11,15) + \sum d(0,2,5,8,14)$.

c. Show the logic circuit for this Boolean equation $Y = (A'+B) \cdot (A+B)$. Then, simplify as much as possible using algebra. Simplify the following Boolean expressions:
$(A' + B + C') \cdot (A' + B + C) \cdot (C + D) \cdot (C + D + E)$

Q3. (2X10=20 Marks) (CO 3)

a. Explain the working of full adder with truth table and logic circuit diagram.

b. Design the 4-bit Binary to Gray code converter with neat diagram.

c. Differentiate between Encoder and Decoder. Also design 2 to 4 line decoder.

Q4. (2X10=20 Marks) (CO 4)

a. Explain race around condition. Draw the circuit of S-R and J-K flip flop using NAND Gate and find out the truth table with equation of each flip flop.

b. Design and explain the working of 4 bit PISO shift registers with suitable diagram.

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c. Design a 3-bit Synchronous counter using JK flip flop which can count only odd number with its waveform

Q5. (2X10=20 Marks) (CO 5)

a. Define RAM and ROM with their types, operation and applications. Implement a PROM for the following Boolean functions:

$$A(x,y,z)=\sum m(5,6,7)$$
$$B(x,y,z)=\sum m(3,5,6,7).$$

b. Explain the PROM, PAL and PLA programmable logic devices with advantages, limitations and applications.

c. Realize the following multiple output function using 3 inputs 4 product terms and 2 output PLA:

$$f1(x,y,z) = \sum m(0,1,3,5)$$
$$f2(x,y,z) = \sum m(3,5,7)$$