Graphic Era HILL UNIVERSITY
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University under section 2(f) of UGC Act, 1956

End Term (Odd) Semester Examination December 2024

Roll no .

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. $(20A4.95)_{16} = (\ \ )_8$
   ii. $(1145.86)_8 = (\ \ )_{16}$
   iii. $(72.22)_8 = (\ \ )_{10}$
   iv. $(1449.44)_{10} = (\ \ )_2$

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:

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