Tribhuvan University
Institute of Science and Technology
2065
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Bachelor Level/ First Year/ Second Semester/ Science — Full Marks: 60
Computer Science and Information Technology (CSc. 151) — Pass Marks: 24
(Digital Logic) — Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Long Answer Questions:
Attempt any TWO questions: (10x2=20)

1. Draw a block diagram, truth table and logic circuit of a 16 x 1 multiplexer and explain its working principle.

2. Explain the 4 bit ripple counter and also draw a timing diagram.

3. Design the full subtractor circuit with using Decoder and explain the working principle.

Short Answer Questions:
Attempt any EIGHT questions: (8x5=40)

4. Design a half adder logic using only NOR gate.

5. Convert the following decimal numbers into hexadecimal and octal number.
   a) 304 b) 224

6. Describe the three Variable K-map with example.

7. Design the Decoder using Universal gates.

8. What is combinational logic? What are its important features.

9. Describe the clocked RS flip-flop.

10. What do you mean by triggering of flip flop?

11. What are the shift Register operations?

12. Describe the Ripple counter.

13. Write short notes on:
    a) Registers.
    b) Digital.
    c) EBCDIC.

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Long Answer Questions:

Attempt any TWO questions. **(2x10=20)**

1. Design the 4 bit Synchronous up/down counter with timing diagram, logic diagram and truth table.
2. Design a Full subtractor with truth table and logic gates.
3. Design a decimal adder with logic diagram and truth table.

Short Answer Questions:

Attempt any EIGHT questions. **(8x5=40)**

4. Differentiate between Analog and Digital system.
5. Convert the following octal numbers to hexadecimal.
   a) 1760.46
   b) 6055.263
6. Which gates can be used as inverters in addition to the NOT gate and how?
7. Draw a logic gates that implements the following
   a) $A = (Y_1 \oplus Y_2)(Y_3 \odot Y_4) + (Y_5 \oplus Y_6 \oplus Y_7)$
   b) $A = (X_1 \odot X_2) + (X_3 \odot X_4) + (X_4 \odot X_5) \oplus (X_6 \odot X_7)$
8. State and prove De-Morgan's theorem 1st and 2nd with logic gates and truth table.
9. Reduce the following expressions using K map
   a. $\bar{A} + B(A + \bar{B} + D)(\bar{B} + C)(B + C + D)$
10. Differentiate between a MUX and DEMUX.
11. Explain the operation of Decoder.
12. What are the various types of shift registers?
13. What do you mean by synchronous counter?

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Long Answer Questions:
Attempt any TWO questions. **(2x10=20)**

1. What is the magnitude comparator? Design a logic circuit for 4 bit magnitude comparator and explain it.

2. What do you mean by full adder and full subtractor? Design a 3 to 8 line decoder using two 2 to 4 line decoder and explain it.

3. What is JK master slave flip-flop? Design its logic circuit, truth table and explain the working principle.

Short Answer Questions:
Attempt any EIGHT questions. **(8x5=40)**

4. Convert the following hexadecimal number to decimal and octal numbers
   a) 0FFF b) 3FFF

5. Design a half adder logic circuit using NOR gates only.

6. Proof the 1st and 2nd law of De Morgan's theorems with logic gate and truth table.

7. What do you mean by Universal gate? Realize the following logic gates using NOR gates.
   a) OR gate b) AND gate

8. Draw a logic circuit of 4 x 1 multiplexer.

9. What is flip-flop? Mention the application of flip-flop.

10. Explain the Ripple Counter.

11. Design the decimal adder.

12. What do you mean by shift registers? Explain.

13. Write short notes on (**any two**):
    a. Decoder
    b. Integrated circuit
    c. PLA.