

CS/BCA/ODD SEM/SEM-1/BCA-101/2016-17



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : BCA-101

DIGITAL ELECTRONICS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own
words as far as practicable.*

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) The output of AND gates with 3 inputs A, B, C is high when
- a) $A = 1, B = 1, C = 0$ b) $A = 0, B = 0, C = 0$
c) $A = 1, B = 1, C = 1$ d) $A = 1, B = 0, C = 1$.
- ii) Conversion of the fractional binary number 10010.0100 to decimal is
- a) 24.50 b) 18.25
c) 18.40 d) 16.25.

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[Turn over

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- iii) Which of the following expressions is in sum of products (SOP) form ?
- a) $(A + B)(C + D)$ b) $(A)B(CD)$
c) $AB(CD)$ d) $AB + CD$.
- iv) Which of the following examples express the commutative law of multiplication ?
- a) $A + B = B + A$ b) $AB = B + A$
c) $AB = BA$ d) $AB = A \times B$.
- v) Which of the following combinations cannot be combined into K-map groups ?
- a) Corners in the same row
b) Corners in the same column
c) Diagonal
d) Overlapping combinations.
- vi) How is J-K flip-flop made to toggle ?
- a) $J = 0, K = 0$ b) $J = 1, K = 0$
c) $J = 0, K = 1$ d) $J = 1, K = 1$.
- vii) What is the hold condition of a flip-flop ?
- a) Both S and R inputs activated
b) No active S or R input
c) Only S is active
d) Only R is active.
- viii) How many flip-flops are required to make a MOD-32 counter ?
- a) 3 b) 45
c) 5 d) 6.

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- ix) Which of the following best describes EPROMs ?
- a) EPROMs can be programmed only once
 - b) EPROMs can be erased by UV
 - c) EPROMs can be erased by shorting all inputs to the ground
 - d) All of these.
- x) The bit sequence 0010 is serially entered (right-most bit first) into a 4-bit parallel out shift register that is initially clear. What are the Q outputs after two clock pulses ?
- a) 0000
 - b) 0010
 - c) 1000
 - d) 1111.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. State de Morgan's law and prove it for 2 variables. 5
3. What is full subtractor ? Explain its basic structure with logic diagrams and truth table. 1 + 4
4. Implement XOR operation using 2 input NOR gates. Verify the output for different combinations of inputs. 3 + 2
5. Simplify the following Boolean expression : $2 \frac{1}{2} + 2 \frac{1}{2}$
- a) $AB + \overline{AC} + A\overline{B}C (AB + C)$
 - b) $\overline{ABC} + \overline{A}BC + A\overline{B}C + ABC$
6. Obtain the minimal expression for $f = \sum m (1, 2, 4, 6, 7)$ and implement it using logic gates. 5

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GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Using K-map method simplifies the following Boolean expressions : $7\frac{1}{2} + 7\frac{1}{2}$
- a) $Y = \sum m (8, 10, 11, 12, 13, 14, 15)$
b) $Y = \sum m (7, 9, 10, 11, 12, 13, 14, 15)$.
8. a) State the main difference between combinational circuit and sequential circuit.
b) Draw the truth table for a three-input adder. Write the Boolean expression for sum and carry.
c) Implement the Boolean expression $F = (A, B, C, D) = \sum (0, 1, 3, 4, 8, 9, 15)$ using 8×1 multiplexer with A, B and D connected to select lines s_2, s_1, s_0 respectively. $5 + 5 + 5$
9. Define flip-flop and write its propagation delay. Draw a block diagram and truth table for JK flip-flop. What is the advantage of JK flip-flop over SR flip-flop ? What do you mean by the race around condition ? $3 + 5 + 4 + 3$
10. a) What is the difference between synchronous and asynchronous counters ?
b) Design a decimal to binary encoder.
c) What do you mean by ring counter ? $5 + 5 + 5$
11. Write short notes on any *three* of the following : 3×5
- a) Ripple counter
b) PROM & EPROM
c) Shift register
d) 4-bit parallel adder subtractor
e) Encoder.