



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

**Paper Code : BCAN-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)**

**I. Choose the correct alternative for any ten of the following:**

**1×10=10**

- (i) In a multiplexer, the output depends on its
- |                    |                   |
|--------------------|-------------------|
| (a) Data inputs    | (b) Select inputs |
| (c) Select outputs | (d) None of these |
- (ii) Which of the following condition is not allowed in SR flip-flop?
- |               |               |
|---------------|---------------|
| (a) $S=0 R=0$ | (b) $S=0 R=1$ |
| (c) $S=1 R=0$ | (d) $S=1 R=1$ |
- (iii) The logical expression  $Y=A+AB+AB'C+A'BC'D+1$  is equivalent to
- |            |       |
|------------|-------|
| (a) $A+C'$ | (b) 1 |
| (c) $A'$   | (d) A |
- (iv) A flip-flop has \_\_\_\_\_.
- |                       |                      |
|-----------------------|----------------------|
| (a) one stable state  | (b) no stable states |
| (c) two stable states | (d) None of these    |

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- (v) The dual of a Boolean expression is obtained by  
(a) interchanging all 0s and 1s  
(b) interchanging all 0s and 1s, all + and \* signs  
(c) interchanging all 0s and 1s, all + and \* signs and complementing all the variables  
(d) interchanging all + and \* signs and complementing all the variables
- (vi)  $A + A'B$  is equal to  
(a)  $A + B$   
(b)  $A$   
(c)  $B$   
(d)  $A' + B$
- (vii)  $11101 + 1100$  is equal to  
(a) 10.1101  
(b) 100.1101  
(c) 10.01101  
(d) None of these
- (viii) In general, a sequential logic circuit consists of  
(a) only flip-flops  
(b) only gates  
(c) flip-flops and combinational logic circuits  
(d) only combinational logic circuits
- (ix) Race condition arises in  
(a) S-R Latch  
(b) S-R F/F  
(c) J-K F/F  
(d) T F/F
- (x) When two  $n$  bit binary numbers are added, the sum will contain at most  
(a)  $n$  bits  
(b)  $n + 1$  bits  
(c)  $n + 2$  bits  
(d)  $n + n$  bits
- (xi) While performing BCD addition, if the value of each 4-bit group becomes \_\_\_\_\_ we add 6 with that group.  
(a) greater than 9  
(b) greater or equal to 9  
(c) greater than 6

**Group - B**

(Short Answer Type Questions)

Answer any three of the following.

5×3=15

2. Difference between Synchronous and Asynchronous counters.

3. Simplify the expressions:

(i)  $A = XYZ + XY'Z + X\bar{Y}$

(ii)  $B = P + P'Q + P'Q'R + P'Q'R'S$

2+3=5

4. Subtract  $(-33)$  from  $(-57)$  using 2's complement method.  
Convert  $(4536)_{10}$  to  
(i) 2421 code  
(ii) 5421 code 3+2=5
5. Draw the truth table and logic circuit of a full-subtractor. Using K-map find out the expression for difference (D) and borrow (B). 5
6. What is flip-flop? What is race condition? 1+4=5

**Group – C**

**(Long Answer Type Questions)**

**Answer any three of the following.**

15×3=45

7. (a) Using K-map method minimize the following expression:  
 $F(w, x, y, z) = m\sum(1,5,6,12,13,14) + d\sum(2,4)$ .  
Implement the logic circuit using NAND gates only.
- (b) Implement Ex-OR gate using NAND Gate and NAND gate using NOR gate. (5+4)+(3+3)=15
8. (a) Define excitation table of flip-flop and propagation delay.
- (b) Using the logic diagram convert a J-K flip-flop D flip-flop and T flip-flop.
- (c) Design a J-K master-slave flip flop with circuit diagram and give the truth table. 5+5+5=15
9. (a) Write down the simplified Boolean expression in  
(i) sum of product form and  
(ii) product of sum form for  
 $Y(A,B,C,D)=\prod M(0,1,3,5,6,7,9,10,11,12,13,15)$
- (b) Implement a full adder using 2 half adders. (4+4)+7=15
10. (a) Design a carry look ahead adder. <http://www.makaut.com>
- (b) Design a combinational logic circuit to implement 4-bit odd parity checker. 9+6=15
11. Write short notes on any three of the following: 5×3=15
- (i) PIPO  
(ii) Ripple Counter  
(iii) 4-bit parallel adder  
(iv) Gray Code  
(v) Master slave J-K flip-flop

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