

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/BCA/SEM-1/BCA-101/2009-10  
2009**

**DIGITAL ELECTRONICS**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

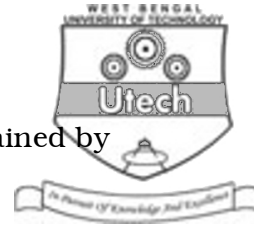
*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A  
( Multiple Choice Type Questions )**

1. Choose the correct alternatives for the following :

$$10 \times 1 = 10$$

- i) A 3-bit synchronous counter uses flip-flops with propagation delay time of 20 ns each. The maximum possible time required for change of state will be
  - a) 60 ns
  - b) 40 ns
  - c) 20 ns
  - d) none of these.
- ii) BCD subtraction is performed by using which complement representation ?
  - a) 1's
  - b) 2's
  - c) 10's
  - d) 9's.
- iii) The SOP form of logical expression is most suitable for designing logic circuits using only
  - a) XOR gates
  - b) NOR gates
  - c) NAND gates
  - d) OR gates.



- iv) The dual of a Boolean function is obtained by
- a) interchanging all 0s and 1s only
  - b) changing 0s to 1s only
  - c) changing 1s to 0s only
  - d) interchanging all 0s and 1s and '+' and '.' signs.
- v) When representing in the following code the consecutive decimal numbers differ only in one bit
- a) Excess-3
  - b) Gray
  - c) BCD
  - d) Hexadecimal.
- vi) In a  $J - K$  flip-flop when  $J = 1$  and  $K = 1$  and clock = 1 the output will be
- a) toggle
  - b) 1
  - c) 0
  - d) recalls previous output.
- vii)  $( AB + A'B + A'B )$  is equal to
- a)  $A + B'$
  - b)  $A' + B$
  - c)  $A + B$
  - d) 1.
- viii) 2's complement of 1010101 is
- a) 0101011
  - b) 10101010
  - c) 1100000
  - d) 1000001.
- ix) The basic fuse technologies used in PROM are
- a) metal links
  - b) silicon links
  - c)  $p-n$  junctions
  - d) all of these.
- x) In general, a boolean expression of  $( n + 1 )$  variable can be implemented using a multiplexer with
- a)  $2^{n+1}$  inputs
  - b)  $2^{n-1}$  inputs
  - c)  $2^n$  inputs
  - d) None of these.



**GROUP – B**

**( Short Answer Type Questions )**

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

2. Draw the neat diagram of 3-bits Bi-directional Shift Register using mode control (  $M$  ). When  $M$  is logic zero then left shift and right shift for  $M$  is logic one.
3. Design 2-bit Gray-Binary converter using basic logic gates with proper truth table.
4. Draw the logic diagram and truth table of  $J - K f/f$ . Why is  $J - K F/F$  much more versatile than  $S - R F/F$  ?
5. What is a full subtractor ? Explain its basic structure with proper logic diagrams & truth tables. 1 + 4
6. Realize the function  $f ( A, B, C ) = \sum m ( 1, 3, 5, 6 )$  by a multiplexer. Discuss the operation logic.

**GROUP – C**

**( Long Answer Type Questions )**

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

7. a) Using  $K$ -map method minimize the following expression :  

$$F ( w, x, y, z ) = m \sum ( 1, 5, 6, 12, 13, 14 ) + d \sum ( 2, 4 ).$$
8
- b) Implement Ex-OR gate using NAND Gate and NAND gate using NOR gate.  $3 \frac{1}{2} + 3 \frac{1}{2}$
8. a) Design and implement Mod-6 synchronous counter considering lock out problem. Is the counter self-starting ? 8 + 1
- b) Explain the difference between Ring and Johnson Counter with proper state diagram and circuit diagram. 6

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9. a) Explain the concept of parity checking.
- b) Discuss about the design of an odd parity generator.
- c) What is biased exponent in relation to Floating Point Representation ( FPR ) ?
- d) Represent ( - 1101011 ) in Floating Point Representation ( FPR ) for a 32-bit CPU. 3 + 4 + 3 + 5
10. What do you mean by race condition in flip-flop ? Design a  $j - k$  flip-flop and discuss its operation. Design and explain the functioning of the 4-bit adder-subtractor circuit.

3 + 5 + 7

11. Write short notes on any *three* of the following : 3 ∞ 5
- a) Universal gates
- b) Decoder
- c) Shift Register
- d) Flip-flop excitation table
- e) Ripple counter.
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