

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH (BME-OLD)/SEM-4/EC-405/2012**

**2012**

**DIGITAL ELECTRONICS CIRCUIT**

*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

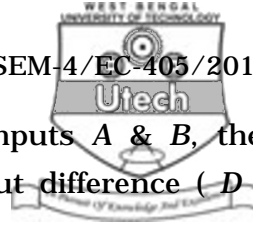
- i) The minimum no of NAND gates required to design one X-OR gate is
- |      |       |
|------|-------|
| a) 4 | b) 5  |
| c) 7 | d) 6. |
- ii) The logic expression  $A\bar{B} + \bar{A}B$  can be implemented by giving inputs  $A$  &  $B$  to a two input
- |              |                |
|--------------|----------------|
| a) NAND gate | b) X-OR gate   |
| c) NOR gate  | d) X-NOR gate. |

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[ Turn over



- iii) A flip-flop is a/an
- a) monostable circuit
  - b) bistable circuit
  - c) astable circuit.
- iv) An example of reflected code is
- a) BCD
  - b) ASCII
  - c) GRAY
  - d) Hamming.
- v) The number of flip-flops required for a mod-16 ring counter are
- a) 4
  - b) 8
  - c) 12
  - d) 16.
- vi) The hexadecimal equivalent of the binary number 11101101111010 is
- a) EDEB
  - b) 35572
  - c) FB7A
  - d) 3B7A.
- vii) The code used in computer cards is
- a) gray code
  - b) natural BCD code
  - c) ASCII code
  - d) 12-bit Hollerith code.
- viii) If each successive code differs from its preceding code by a single bit only, then this code is called
- a) BCD code
  - b) gray code
  - c) weighted code
  - d) binary code.



ix) For a binary half subtractor with inputs  $A$  &  $B$ , the correct logic expression for the output difference ( $D$ ) and the borrow ( $X$ ) are

a)  $D = AB + \bar{A}B$  ;  $X = \bar{A}B$

b)  $D = \bar{A}B + A\bar{B}$  ;  $X = A\bar{B}$

c)  $D = \bar{A}B + A\bar{B}$  ;  $X = \bar{A}B$

d)  $D = AB + \bar{A}B$  ;  $X = A\bar{B}$ .

x) The characteristic equation of  $T$  flip-flop is given by

a)  $Q^+ = \bar{T}Q + T\bar{Q}$       b)  $Q^+ = T\bar{Q} + \bar{T}Q$

c)  $Q^+ = T\bar{Q}$       d)  $Q^+ = TQ$ .

### GROUP - B

#### ( Short Answer Type Questions )

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

2. Draw and explain the construction of 2 input NAND gate with tristate logic of TTL logic family.

3. Simplify the following expression using the Karnaugh map.

$$X = B\bar{C}\bar{D} + \bar{A}B\bar{C}\bar{D} + AB\bar{C}D + \bar{A}BCD + ABCD.$$

4. What is Race around problem in flip-flops ? How can it be avoided ?

5. What are minterms ? Simplify the expression by Boolean algebra

$$F = AB + \bar{A}C + A\bar{B}C (AB + C). \quad 2 + 3$$

6. Construct a full subtractor with the use of multiplexer.



**GROUP – C**

**( Long Answer Type Questions )**

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

7. What are governing parameters to describe the specification of an A/D converter ? Which is the fastest type of A/D converter ? Describe the operation of Successive Approximation type A/D converter.  $3 + 2 + 10$

8. a) Realise a JK flip-flop ( clocked type ) with NAND gates.  
b) Realise the following counter by D Flip-flop.

$\rightarrow 0 \rightarrow 3 \rightarrow 2 \rightarrow 5 \rightarrow 7 \rightarrow$

9. Write short notes on any *three* of the following :  $3 \times 5$

- a) Sequential circuit  
b) CMOS TTL interfacing  
c) Demultiplexer  
d) Asynchronous state machine.
10. a) Explain the principle of operation of a parallel in serial out shift register with block diagram.  
b) Design a 4-bit Bidirectional shift register.  
c) Write down the application of shift register.  $6 + 6 + 3$
11. Explain the operation of a 4-bit Up-Down counter with its timing digram.

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