ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER – 2007

DIGITAL ELECTRONICS & LOGIC DESIGN

SEMESTER – 3

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Convert $(444.456)_{10}$ into its octal equivalent

a) 673.5136 b) 674.35136

c) 674.735 d) none of these.

ii) $\left(A + \bar{B} + \bar{A}B \right) C =$

a) 1 b) 0

c) C d) $\bar{C}$.

iii) How many 1's are present in the binary representation of decimal number $(3 \times 512 + 7 \times 64 + 5 \times 8 + 3)$?

a) 8 b) 9

c) 10 d) 11.

iv) An example of reflected code is

a) BCD b) ASCII

c) GRAY d) Hamming.

v) The value of 2^5 in octal system is

a) 40 b) 20

c) 400 d) none of these. ☐

vi) The minimum number of NAND gates required to design one XOR gate is

a) 4 b) 5

c) 6 d) 3. ☐

vii) The operation which is commutative but not associative is

a) AND b) XOR

c) NAND d) NOT. ☐

viii) A decoder with enable i/p can used as

a) Encoder b) Parity generator

c) Multiplexer d) DeMultiplexer. ☐

ix) The resolution of an 8 bit A/D converter is

a) 0.62% b) 0.38%

c) 0.39% d) 1.25%. ☐

x) A 10 MHz square wave clocks have a 5 bit ripple counter. The frequency of the 3rd flip-flop's output is

a) 2 MHz b) 1.25 MHz

c) 50 kHz d) 25 kHz. ☐

xi) If $(212)_x = (23)_{10}$, where x is base (+ *ve* integer), then the value of x is

a) 2 b) 3

c) 5 d) 4. ☐

xii) Calculator keyboard is an example of

a) decoder b) multiplexer

c) encoder d) de Multiplexer. ☐

xiii) The carry output of a full adder is three input

a) majority logic b) minority logic

c) XOR logic d) NAND logic. ☐

xiv) Flip-flop that makes output equals to input after clock is

a) J-K flip-flop b) D flip-flop

c) T flip-flop d) None of these. ☐

xv) One-bit even parity error detection code fails to detect

a) any even number of error b) any odd number of error

c) both (a) and (b) d) none of these. ☐

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Simplify the Boolean function using K-map

$F (W, X, Y, Z) = \Sigma m (0, 4, 5, 6, 8, 9) + \Sigma d (10, 11, 12, 13, 14, 15)$.

3. Implement the following function using all 4 : 1 multiplexers

$F = \sum m\ (0, 2, 3, 6, 8, 9, 12, 14)$

4. Implement a full-adder circuit using a 3 to 8 decoder with all active-low outputs and one additional logic gate if required.

5. Define the following terms in relation with logic families : 5×1

a) propagation delay

b) fan-in

c) fan-out

d) power dissipation

e) floating inputs.

6. Find out the 7's complement of $(-756)_8$.

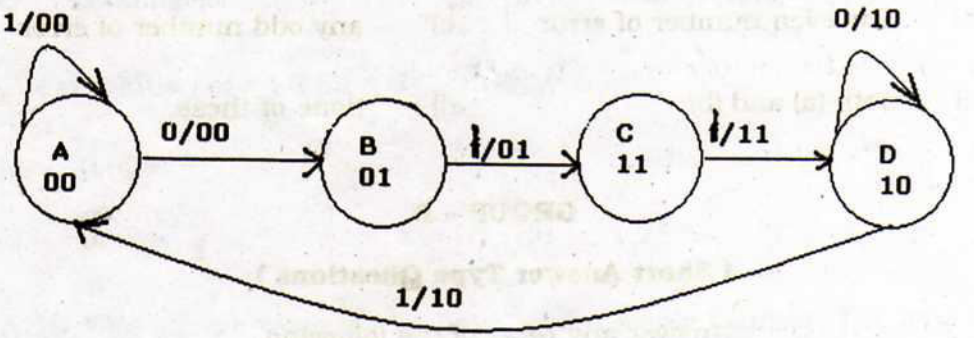
GROUP – C

(Long Answer Type Questions)

Answer any *three* questions. $3 \times 15 = 45$

7. a) Design an asynchronous 4-bit up-down counter and it will count up when a signal line $M = 0$ and count down when a signal line $M = 1$.

b) Design a circuit that will function as prescribed by the state diagram shown below. Use S-R flip-flops for implementation.



State Diagram

6 + 9

8. a) With the help of necessary circuit diagram explain the operation dual slop ADC.

b) A 4-bit binary ladder D/A converter with R = 10 KΩ uses a reference of 5 V. Find

i) the ideal scale factor in V/step

ii) the analog o/p corresponding to the binary i/p 0110

iii) resolution in %

iv) full scale o/p

v) the maximum deviation in volts from the best straight line in order to meet standard linearity. $5 + 5 \times 2 = 15$

9. a) Design a BCD to 7-segment common anode display code converter using PROM type PLD.

b) Implement the following functions using a $3 \times 4 \times 2$ PLA :

$F_1 (A, B, C) = \Sigma (3, 5, 6, 7)$

$F_2 (A, B, C) = \Sigma (0, 2, 4, 7)$. $7 + 8$

10. a) Simply the following function by means of tabulation method :

$F = \Sigma m (0, 1, 4, 7, 9, 11, 13, 15) + \Sigma d (3, 5)$.

b) Simplify the following function using K-map.

i) $F = \prod m (0, 1, 3, 8, 10, 15) . \prod d (11, 13, 14)$

ii) $F = \Sigma m (0, 4, 7, 9, 13, 15) + \Sigma d (10, 14)$ $5 + 5 + 5$

11. Write short notes on any *three* of the following : 3×5

a) EPROM

b) PLD

c) A/D converter

d) Johnson counter.

END