Roll No. ..... Total Pages : 04

BT-3/D-20 **43158**

DIGITAL ELECTRONICS AND LOGIC DESIGN

ES-217A

Time : Three Hours] [Maximum Marks : 75

Note : All questions in Part A and Part B are compulsory. Attempt any *four* questions from Part C selecting *one* question from each Unit.

Part A **15**

1. Answer the following questions : **5×3=15**

(i) State and explain De Morgan's theorem. Explain designing of OR gate using NAND gates.

(ii) Express 456 and 272 in BCD code, Excess 3 and Gray code.

(iii) Explain designing of 4 bit gray to binary code converter.

(iv) State the difference between positive edge triggering, negative edge triggering and level triggering of flip-flops.

(v) Draw and explain working of sampling and hold circuit.

Part B 20

2. Perform the following operations :

(i) $(27)_2 + (53)_2$

(ii) $(34 - 48)_2$ using BCD arithmetic

(iii) Simplify (A + B)(A' + C) to minimum number of literals. Implement the obtained expression using And, OR, Inverter logic. **5**

3. Explain the designing of full adder. **5**

4. Draw a diagram for 5 bit ring counter using JK flip-flop. Explain its working with the help of timing diagram. **5**

5. Draw the diagram of R-2 R ladder D/A Converter. Explain its working. **5**

Part C 40

Unit I

6. Using Q-M method, obtain the minimal expression for $F = \Sigma m\{2, 4, 6, 7, 8, 13, 15\} + d(10, 11, 12, 14)$. Also realize the expression using NAND gate only. **10**

7. Reduce the following expressions using K-Map :

(a) $F = \Pi M(1, 2, 5, 6, 8, 9, 10)$

(b) $f = \Sigma(0, 1, 4, 7, 13, 14) + d(5, 8, 15)$.

Realise the obtained expressions using NAND/NOR logic. **10**

Unit II

8. (a) State and explain the working of BCD adder with its logic diagram. **6**

(b) Design a octal to binary encoder. **4**

9. What do you mean by multiplexer ? Explain the working of n : 1 mux. Implement the function $F(A, B, C, D) = \Sigma(0, 1, 3, 4, 8, 9, 13)$ using 8×1 mux. **10**

Unit III

10. (a) Explain the working of JK flip-flop. What is race around condition in JK flip-flop ? How can it be solved by master slave flip-flop ?

(b) Design an asynchronous mod-10 counter. Use JK flip-flop for designing the counter. **10**

11. What do you mean by register ? Draw the logic diagram of universal shift register. Explain its working. **10**

Unit IV

12. Draw and explain the working of dual slope type A/D converter. **10**

13. What is difference between PLA and PAL ? Implement the following Boolean functions using PLA :

F1(A, B, C) = Σ*m*(1, 2, 4, 6). *f* 2(A, B, C) = Σ*m*(0, 1, 5, 7), *f* 3(A, B, C) = Σ*m*(1, 2, 3, 5, 7). **10**