

Roll No.

Total Pages : 03

BT-3/D-22

43168

**DIGITAL ELECTRONICS AND LOGIC
DESIGN
ES-217A**

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) State and prove the De-Morgan theorem. Prove the following expressions :

$$\overline{A}BC + A\overline{B}C + ABC\overline{C} + ABC = AB + BC + CA$$

$$(A + B)(C + D) = \overline{\overline{A + B} \overline{C + D}} \quad 4$$

- (b) What are universal gates ? Perform AND operation using NOR gate. 4

- (c) Reduce the following expressions using K-Map :
 $f = \Sigma (0, 1, 4, 5, 7, 13, 14, 15) + d (2, 9, 10, 12).$
Realise the obtained expressions using NAND/NOR logic. 7

2. (a) Explain the method of converting SOP representation into POS representation. 4

- (b) Perform the following operations in binary number system : 6
- (i) $23 + 15$
 - (ii) $16 - 36$ (using 1's compliment)
 - (iii) $17 - 9$ (using 2's compliment).
- (c) Design a four bit grey to binary and binary to grey code converter. 5

Unit II

3. (a) Design a full adder using two half adders. 7
- (b) What is Encoder ? Design and explain the working of 8 : 3 encoder ? 8
4. What is Multiplexer ? Explain working of 8 : 1 Multiplexer. How can 16 : 1 MUX be designed using 8 : 1 Mux and OR gate ? Implement the function $f = \Sigma (1, 2, 6, 9, 13, 14, 15)$ using 8 : 1 Mux. 15

Unit III

5. (a) Differentiate between latch and flip-flop. Explain the working of JK flip-flop. Explain race around condition of JK flip-flop. Also describe, how is it removed by master slave flip-flop ? 10
- (b) Convert D flip-flop to T flip-flop. 5
6. (a) Design mod 6 asynchronous counter. 7
- (b) Design a bidirectional shift register. Explain its working. 8

Unit IV

7. (a) Mention specifications of DACs. Explain the working of weighted register D/A converter. 8
- (b) Explain the working of flash type ADC. 7
8. (a) Explain the working of successive approximation type A/D converter. 7
- (b) Differentiate between PAL and PLA. Implement NAND operation using PLA. 8

