



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.

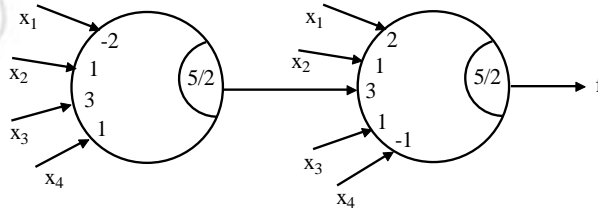
1. a) Simplify the function using k-map $f(v, w, x, y, z) = \sum m(0, 1, 3, 8, 9, 13, 14, 15, 16, 17, 19, 24, 25, 27, 31)$ **6**
- b) Minimize the following function using Q – M method & verify the result by k-map. **7**
 $F(A, B, C, D) = \sum m(1, 4, 5, 7, 9, 12, 14) + \sum d(3, 13, 15)$

OR

2. a) Given the following three partitions on the **6**
 Set $S = \{a, b, c, d, e, f, g, h, i, j, k\}$
 $\pi_1 = \{\overline{a, b, c}; \overline{d, e, f}; \overline{g, h, i}; \overline{j, k}\}$
 $\pi_2 = \{\overline{a, b}; \overline{c, g, h}; \overline{d, e, f}; \overline{i, j, k}\}$
 $\pi_3 = \{\overline{a, b, c, f}; \overline{d, e}; \overline{g, h, i, j, k}\}$
 i) Find $\pi_1 + \pi_2$ & $\pi_1 \cdot \pi_2$
 ii) Find $\pi_1 + \pi_3$ & $\pi_1 \cdot \pi_3$
 iii) Find the partition that is greater than π_1 & smaller than π_3
 iv) Can you find the partition that is greater than π_2 & smaller than π_3
- b) Solve the following function using Q-M (Tabulation Method) **7**
 $F(A, B, C, D) = \sum m(2, 3, 4, 7, 8, 11, 13, 14) + \sum d(1, 5, 10)$
3. a) $F(w, x, y, z) = \sum m(1, 3, 5, 7, 8, 11, 13, 15)$ Decompose into the form of $f[\phi(x, y); wz]$ **7**
 Find function f & ϕ .
- b) Determine whether the function is symmetric or not. Express it in the symmetric form **6**
 $F(w, x, y, z) = \sum m(0, 1, 3, 5, 8, 10, 11, 12, 13, 15)$

OR

4. a) For the following function find a contact network. If it can be realized with minimum number of contacts $S_{0,1,3}(w, x, y, z)$ **6**
- b) The function $f(v, w, x, y, z) = \sum m(4, 8, 10, 16, 21, 27, 28) + \sum d(1, 5, 23, 25, 30, 31)$ It can be decomposed into the form of $F[\phi(v, y, z); wx]$ Determine the functions F & ϕ . **7**
5. a) $F(x_1, x_2, x_3, x_4) = \sum(0, 1, 3, 4, 5, 6, 7, 12, 13)$ is the Threshold function & if it is then find it's weight threshold vector. **7**
- b) Find the function $f(x_1, x_2, x_3, x_4)$ realized by the Threshold network shown in figure below. **6**



OR

6. a) Switching function is given as $f(x_1, x_2, x_3, x_4) = \sum m(2, 3, 6, 7, 10, 12, 14, 15)$ find minimal Threshold logic realization. **7**
- b) For $f(x_1, x_2, x_3) = \sum m(1, 2, 3, 7)$. Find corresponding weighted Threshold vector. **6**
7. a) Design a Mealy circuit for sequence 0101 in which overlapping is allowed. Implement the function using 'D' flipflop'. **7**
- b) For the machine shown in table below find the equivalence partitions & a corresponding machine in Reduced form & in standard form. **7**

PS	NS, 2	
	x = 0	x = 1
A	B, 0	E, 0
B	E, 0	D, 0
C	D, 1	A, 0
D	C, 1	E, 0
E	B, 0	D, 0

OR

8. a) Design Moore circuit for sequence "1001" in which overlapping is allowed. Implement the function using 'JK' flipflop. **7**
- b) For the incompletely specified machine shown in table. Find a minimum state reduced machine containing original one. **7**

PS	NS, 2			
	I ₁	I ₂	I ₃	I ₄
A	-	-	E, 1	-
B	C, 0	A, 1	B, 0	-
C	C, 0	D, 1	-	A, 0
D	-	E, 1	B, -	-
E	B, 0	-	C, -	B, 0

9. a) The primitive flow table describes an asynchronous system. Make a reduced state table. 7

		$x_1 x_0$			
		00	01	11	10
P.S.	a	d/-	-/-	e/-	Ⓐ/1
	b	d/-	Ⓑ/1	e/-	-/-
	c	Ⓓ/-	-/-	e/-	Ⓒ/0
	d	d/0	b/1	e/-	a/-
	e	-/-	b/-	Ⓔ/0	c/0

b) For the machine shown in table below. Find the equivalence partitions & a corresponding reduced machine in standard form. 6

PS	NS, 2	
	x = 0	x = 1
A	E, 0	C, 0
B	C, 0	A, 0
C	B, 0	G, 0
D	G, 0	A, 0
E	F, 1	B, 0
F	E, 0	D, 0
G	D, 0	G, 0

OR

10. a) For the following machines Determine whether or not it has a finite memory & if it is then find its order. 6

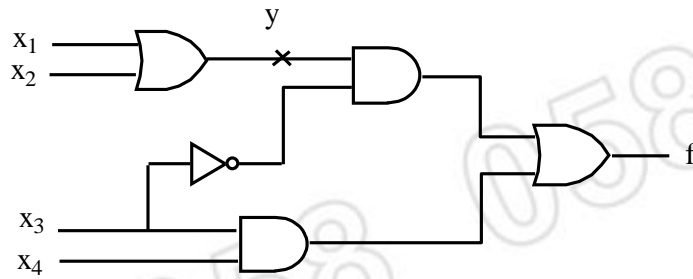
P.S.	NS, 2	
	x = 0	x = 1
A	B, 0	D, 0
B	C, 0	C, 0
C	D, 0	A, 0
D	D, 0	A, 1

b) The primitive flow table describes an asynchronous sequential circuit. Make a reduced state table 7

		$x_2 x_1$			
		00	01	11	10
P.S.	a	Ⓐ/0	b/-	-/-	c/-
	b	d/-	Ⓑ/1	-/-	-/-
	c	d/-	-/-	-/-	Ⓒ/1
	d	Ⓓ/1	b/-	-/-	c/-

11. a) Consider the function containing static hazards $f(x, y, z) = \sum m(2, 3, 5, 7)$. Determine the hazard free network. Also explain static hazards. 7

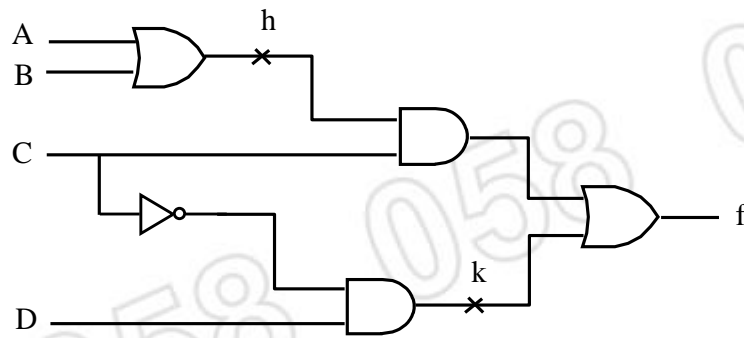
b) For the following circuit detect s - a - 0 & s - a - 1 at y by Boolean difference. 7



OR

12. a) For the circuit of figure. 7

- i) Find tests to detect the faults
 h - s - a - 0 & h - s - a - 1,
 k - s - a - 0 & k - s - a - 1



b) For the following combinational circuit, detect s - a - 0 & s - a - 1 at x₃ by Boolean difference. 7

