3 Hours **[Total Marks 80]**

NB: 1. Question No. 1 is compulsory
2. Solve any three questions from remaining
3. Assume suitable data whenever necessary and justify the assumption.

Q.1. a) I is possible to realize the logic function F(A, B, C)=$\sum m(1,2,4,7)$ using a single threshold gate? 05

b) What is incompletely specified machines and how to specify using compatible states? 05

c) Differentiate between Mealy and Moor type state machine. 05

d) Differentiate between Synchronous and Asynchronous sequential circuits. 05

Q.2. a) Draw the state diagram and the state table for Moore type sequence detector to detect the sequence 101. 10

b) Using Quine-McCluskey method of tabular reduction minimize the given combinational single output function f(W,X,Y,Z)=$\sum m(0,1,5,7,8,10,14,15)$ 10

Q.3. a) Realize the Boolean function using threshold gate 10
F(x_1, x_2, x_3, x_4)= $\sum m(0,1,4,5,8,9,11,13)$

b) Obtain the minimal SOP and POS expression for the following: 10

$$f = \sum m(0,2,7,8,10,13,16,18,24,26,29,31,32,34,37,39,40,42,45,47,48,50,53,55,56,58,61,63)$$

Q.4 a) What are the components of ASM chart? Draw an ASM chart to describe a mealy state machine that detects a sequence of 101 and that asserts a logical 1 at the output during the last state of the sequence.

b) Design a 3-bit counter which counts in the following sequence using T flip flop.
0 → 1 → 3 → 4 → 5 → 7 → 0……..etc.

Q.5 a) Explain homing and synchronizing sequence techniques with example. 10

b) i) Explain the state equivalence & distinguishable state in Finite state machine. Reduce the state machine M by partition method. 10

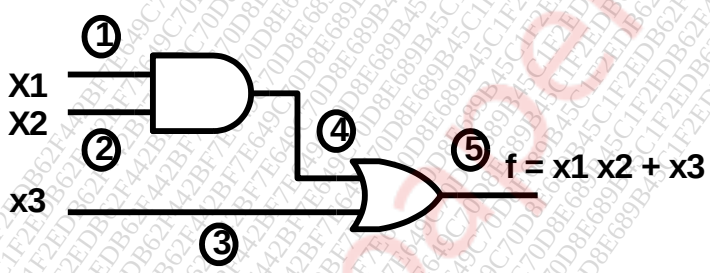
Table No. 1

M

NS			z	
PS	**x=0**	**x=1**	**x=0**	**x=1**
A	E	C	0	0
B	F	C	0	1
C	E	A	0	0
D	F	A	0	1
E	A	D	0	0
F	D	E	0	1

ii) Write a state equations for the reduces machine M in above question and realized it using gates.

Q.6 a) i) Find the fault table for all stuck-at faults of the following circuit 10
ii) prepare test generation using exclusive or method



b) The set {a,b,c,d,e,f,g,h,i,j,k} has the partitions 10

$$\pi_1 = \{\overline{a,b,c}\,;\overline{d,e};\overline{f};\ \overline{g,h,\imath};\overline{\jmath,k}\}$$
$$\pi_2 = \{\overline{a,b}\,;\overline{c,g,h}\,;\overline{d,e,f};\overline{\imath,\jmath,k}\}$$
$$\pi_3 = \{\overline{a,b,c,f}\,;\overline{d,e,g,h,\imath,\jmath,k}\}$$

i) Find $\pi_1 + \pi_2$ and $\pi_1.\pi_2$
ii) Find $\pi_1 + \pi_3$ and $\pi_1.\pi_3$
iii) Find a partition that is greater than π_1 and smaller than π_3.

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