2123
B.E. (Electronics and Communication Engineering)
Fifth Semester
EC-505: Digital System Design

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.

x-x-x

1. (i) When is any boolean expression said to be in canonical form? Explain.
   (ii) What is the role of cycles in asynchronous sequential circuits?
   (iii) What do you mean by the term non-weighted codes? List two examples.
   (iv) Draw the state diagram of a twisted-ring counter.
   (v) Differentiate between mealy and moore models for a FSM. (2 x 5)

Part-A

2. (a) Find the minimal boolean POS expression using K-map method and implement circuit using universal gates. (5)

   $F(x, y, z, w, u) = \pi M\ (2, 3, 7, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20, 21, 23, 26, 27)$

   (b) The message 1001001,0111001,1110110,0011011, coded in the 7-bit Hamming code is transmitted though a noisy channel. Decode the message assuming that atmost a single-bit error has occurred in each code word using even parity. (5)

3. (a) Find the minimal complete test set for detecting all the distinguishable single faults for the boolean expression $F\ (x_1, x_2, x_3) = x_1 x_2 + x_3$ using fault-table method. (5)

   (b) Minimize the function using iterative consensus tabular method. (5)

   $F(x, y, z) = xyz + x'z' + xyz' + x'y'z + x'yz'$

4. (a) Minimize the set of completely specified function using Q-M method. (5)

   $F\ (A, B, C, D, E) = \sum m\ (0, 1, 3, 8, 9, 13, 14, 15, 16, 17, 19, 25, 27, 31)$

   (b) What is boolean difference method of fault detection and location? Explain its steps using a suitable example. (5)

Part-B

5. Design a mealy model sequence detector to detect the sequence "1001" or "1010" by using D flip-flop. Assume overlapping is allowed. (10)

6. (a) For the incompletely specified finite state machine, find the set of maximal compatibles using merger graph method. (5)

Present state (PS)	Next state, output (NS, Z)			
	I_1	I_2	I_3	I_4
A	–	C, –	–	–, 1
B	A, 1	–	B, 0	–
C	–	–	–	D, 1
D	C, –	A, –	C, –	F, 0
E	B, –	B, –	A, –	–, 0
F	–, 0	C, 1	–	H, 1
G	–, 1	E, 1	F, 1	D, 1
H	–, 1	G, –	–	F, 1

   (b) What are the basic elements of an Algorithmic State Machine chart? Using a mod-8 binary counter, explain it. (5)

7. (a) Define hazards. Why do they occur in asynchronous sequential circuits? How can they be avoided? Explain in detail. (5)

   (b) Write a short note on faults detection and location for sequential circuits. (5)

x-x-x