[Total No. of Questions - 9] [Total No. of Printed Pages - 3] (2064)

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B. Tech 6th Semester Examination

Electronic Logic Circuit Design

EEE-6001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question each from section A, B, C & D. Section-E is compulsory.

SECTION - A

1. (a) Convert S-R flip-flop to J-K flip-flop. (8)

   (b) Design 3-bit grey code counter circuit using T flip-flop. (12)

2. Draw a two input, two output synchronous sequential circuit which examines the input sequence in non- overlapping strings of three inputs each and produces a one output coincident with the last input of the string if and only if the string consisted of either 1 or 2 1 ‘s. Use S-R flip-flop in your realization. (20)

SECTION - B

3. For each of the machines shown in table 1 and 2, find a minimum state reduced machine containing the original one. (10×2=20)

Table 1			
PS	NS,z		
	I_1	I_2	I_3
A	C,0	E,1	–
B	C,0	E,–	–
C	B,–	C,0	A,–
D	B,0	C,–	E,–
E	–	E,0	A,–

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

4. What is meant by decomposition? Compare the various decomposition techniques in detail. (20)

SECTION - C

5. The output z of a fundamental mode, two input sequential circuit is to change from 0 to 1 only when x_2 changes from 0 to 1 while x_1 =0. The output is to change from 1 to 0 only when x_1 changes from 0 to 1 while x_2 =1.

   (i) Find a minimum row reduced flow table. The output should be fast and flicker free.

   (ii) Show a valid assignment and design a circuit using minimum number of components. (20)

6. Design an asynchronous sequential circuit with two input x_1 and x_2, and two outputs G and R, which is to operate in the following manner. Initially both input and output are equal to O. The first input to become equal to 1, either x_1 or x_2, turns G “on” (i.e. sets G to 1). With the first input equal to 1, if the second input becomes equal to 1, then R turns on. Thereafter as long as either input remain equal to 1, the input which first caused G

to turn on control the operation of G, i.e. it causes G to turn off when it becomes 0, and it turn it on again when it becomes 1. The second input controls the operation of R in the same manner. (20)

SECTION - D

7. (a) Design a hazard free combinational circuit for the function given below:

   $F(A,B,C,D)' = \Sigma m(0,1,2,3,4,7,8,9,12,13)$ (10)

   (b) Write note on dynamic hazards. (10)

8. (a) Design Hazard free T type flip-flop. (12)

   (b) Explain, Essential Hazards in Asynchronous sequential circuits. (8)

SECTION - E

9. (a) Differentiate between combinational and sequential circuits.

   (b) Differentiate between synchronous and asynchronous sequential circuits.

   (c) What are fundamental mode circuits?

   (d) Prove that the equivalence partition is unique.

   (e) Prove that if two states, Si and Sj, of machine M are distinguishable, then they are distinguishable by a sequence of length n-1.

   (f) What are critical and non critical races in asynchronous sequential circuits?

   (g) Why state assignment is important in asynchronous sequential circuits?

   (h) Explain the operation of 4-bit right shift register using j-k flip-flops?

   (i) What do you mean by static -1 hazard in digital circuits?

   (j) Two states are k-equivalent. What does it means?

   (2×10=20)