

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

14714

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)

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[P.T.O.]

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