

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]  
(2125)

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**B. Tech 4th Semester Examination**  
**Electronic Logic Circuit Design (OS)**

EC-4003

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**

- (a) Convert S-R flip-flop to T flip-flop. (8)  
(b) Design 3-bit binary up-down counter circuit using T flip-flop. (12)
- Draw a two input, two output synchronous sequential circuit which produces an output  $z=1$  whenever any of the following input sequences occur: 1100, 1010, or 1001. The circuit resets to its initial state after a 1 output has been generated. Use J-K flip-flop in your realization. (20)

**SECTION - B**

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

PS	NS,Z		
	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>
A	C,0	E,1	-
B	C,0	E,-	-
C	B,-	C,0	A,-
D	B,0	C,-	E,-
E	-	E,0	A,-

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

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

**SECTION - C**

- Give a minimum row, reduced flow table description of a two input ( $x_1, x_2$ ), one output ( $z$ ) sequential circuit which operates in the following manner:  $z=1$  if and only if  $x_1=x_2=1$  and the next to last input variable change was a change of  $x_1$ . Assume that the circuit is initially in the state  $x_1=x_2=0$ . (20)
- Design a asynchronous sequential circuit with two inputs,  $x_1$  and  $x_2$ , and two output  $z_1$  and  $z_2$ , is to be designed so that  $z_i$  (for  $i=1,2$ ) takes on the value 1 if and only if  $x_i$  was the input that changed last. (20)

**SECTION - D**

- (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)
- (a) Design Hazard free D type flip-flop. (12)  
(b) Explain, Essential Hazards in Asynchronous sequential circuits. (8)

**SECTION - E**

- (a) Write different steps for the synthesis of Asynchronous 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) Why races are introduced in asynchronous sequential circuits?
- (f) What is meant by propagation delay?
- (g) Why state assignment is important in asynchronous sequential circuits?
- (h) Draw the circuit of parallel in parallel output register using j-k flip-flops?
- (i) What do you mean by static-1 hazard in digital circuits?
- (j) Two states are k-distinguishable. What does it mean?  
(2×10=20)