This question paper contains 4 printed pages.

3352 *Your Roll No.* .....

B. Tech. (EC) / IV **J**

Paper EEC–404 (*d*)

SWITCHING AND AUTOMATA THEORY

Time : 3 hours *Maximum Marks* : 70

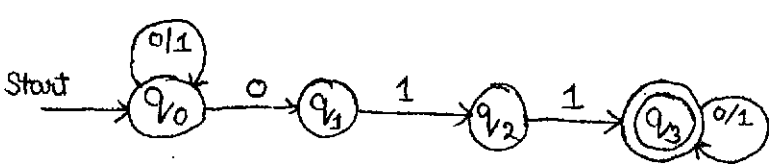
(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any five questions.
All questions carry equal marks.

1. (*a*) State what you understand by non-deterministic finite automata. Explain the meaning of each term. 4

   (*b*) Let M= (Q, $\sum$, δ, q_0, F) be a NFA. How do you transform the same into DFA? 4

   (*c*) Obtain a DFA equivalent to the NFA given below: 6



2. (*a*) What do you mean by easily testable circuits? 2

   (*b*) What is the need to impose built-in efficient fault detection capabilities? 2

P. T. O.

(c) If you design a circuit of a combinational logic with the help of Reed-Muller canonic expansion, how can the same be an easily testable combinational circuit? Discuss about the test pattern which would detect all types of stuck-at-faults in the circuit. 10

3. (a) Identify all simple disjoint decompositions for the following switching functions:

$$f(x_1, x_2, x_3, x_4) = \sum_m(0, 3, 4, 7, 13, 14)$$ 4

(b) Determine if the following function is symmetric and also identify its a-numbers and the variables of symmetry:

$$f(w, x, y, z) = \sum(2, 4, 7, 13, 16, 19, 21, 26, 29, 31)$$ 10

4. (a) Define pulse-mode and the fundamental-mode of operation for the synchronous sequential machine. 4

(b) Convert the Mealy machine given in the table below into equivalent Moore machine:

PS.	NS, Z	
	$x=0$	$x=1$
A	C, 0	B, 0
B	A, 1	D, 0
C	B, 1	A, 1
D	D, 1	C, 0

4

(c) Draw the state diagram of a sequence detector with single input and single output that gives an

output Z=1 in the next clock pulse if it receives an overlapping input sequence 10101. 6

5. (*a*) Do you agree to the statement that for all non-deterministic finite automata there are some equivalent deterministic finite automata or automatas. Give your reasons. 6

   (*b*) Find the threshold logic realization of the switching function given below:

   $$f(x_1, x_2, x_3, x_4) = \sum(3, 5, 7, 10, 12, 14, 15)$$ 8

6. Construct the ASM chart to design a digital system with three 16-bit registers AR, BR and CR to perform the following operations:

   (*i*) Transfer two 16-bit numbers (in 2's complement representation) to AR and BR.

   (*ii*) If the number in AR is negative, divide the number in AR by 2 and transfer the result to register CR.

   (*iii*) If the number in AR is positive but non-zero, multiply the number in BR by two and transfer the result to CR.

   (*iv*) If the number in AR is zero, clear the register CR to zero. 14

7. Write short notes on any *two* of the following:

   (*i*) Walsh function and its importance

   (*ii*) Regular expressions

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