



ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER - 2007
FORMAL LANGUAGE AND AUTOMATA THEORY
SEMESTER - 5

Time : 3 Hours]

[Full Marks : 70

GROUP - A**(Multiple Choice Type Questions)**

1. Choose the correct answer from the given alternatives :

10 × 1 = 10

i) Consider

PS	Next state		O/P
	X = 0	X = 1	
q ⁰	q ²	q ³	0
q ¹	q ¹	q ²	1
q ²	q ³	q ²	1
q ³	q ¹	q ⁰	0

PS = present state.

Considering the following Moore M/C, find out the o/p string for the i/p string 1010.

(where q₀ is the initial state).

- a) 10011 b) 00110
 c) 10111 d) 01111.

ii) $S \rightarrow aABC \mid a$ $A \rightarrow aA \mid B$ $B \rightarrow aBA \mid C$ $C \rightarrow \lambda \mid aC$

The null-able variables for the above grammar are

- a) S, A, B, C, b) A, B
 c) S, A, C d) A, B, C.



**GROUP - C****(Long Answer Type Questions)**Answer any *three* questions. $3 \times 15 = 45$

7. i) Test whether the following machine is definite or not :

- a) By using synchronizing tree. 2
- b) By using repeated derivation of contraction tables. 2
- c) If the machine is definite, what is the order of definiteness ? Justify. 2

PS	NS	
	$x = 0$	$x = 1$
A	A	B
B	C	B
C	A	D
D	C	B

ii) Consider the following machine :

PS	NS			
	I_1	I_2	I_3	I_4
A	—	—	E, 1	—
B	C, 0	A, 1	B, 0	—
C	C, 0	D, 1	—	A, 0
D	—	E, 1	B, -	—
E	B, 0	—	C, -	B, 0

- a) Draw the merger graph. 2
- b) Draw the merger table. 2
- c) Draw the compatibility graph. 2
- d) Find the minimal closed covering with justification. 3

8. a) Design the NFA for the language $L = (ab \cup aba)^*$. 5

b) Let $G = \{ V_N, V_T, S, P \}$ be a phase-structure grammar, where $V_N = \{ S, B \}$, $V_T = \{ a, b \}$, $P = \{ S \rightarrow aBa, B \rightarrow aBa, B \rightarrow b \}$, Find $L(G)$. 5



- c) State the difference between DFA and NFA. Find the transition diagram of the NFA with the state table shown below :

$$A = \{ 0, 1 \}, S = \{ s_0, s_1, s_2 \}, F = \{ s_0 \}.$$

5

N		
S		
s_0	ϕ	$\{ s_1, s_2 \}$
s_1	$\{ s_2 \}$	$\{ s_0, s_1 \}$
s_2	$\{ s_0 \}$	ϕ

9. Consider the machine given below :

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

- a) Derive the closed partitions. Construct a π -lattice for it. 5
- b) Find the state tables for the parallel components after decomposing the machine into parallel components. 5
- c) Draw a schematic diagram of the machine with these parallel components. 5
10. Design a two-input, two-output sequence detector, which produces an output of 1 every time the sequence 0101 is detected and an output of 0 at all other times. Draw the circuit diagram using gates. 15



11. a)

PS	NS	
	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

Find the equivalence partitions for the machine above. Also find a standard form of the corresponding reduced machine. What is the minimum length sequence that distinguishes state A from State B ?

b)

PS	NS	
	x = 0	x = 1
A	F, 0	B, 1
B	G, 0	A, 1
C	B, 0	C, 1
D	C, 0	B, 1
E	D, 0	A, 1
F	E, 1	F, 1
G	E, 1	G, 1

Find the equivalence partitions for the machine above. Also find a standard form of the corresponding reduced machine.

8 + 7

 END