



## Theory of Computer Science (1020)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

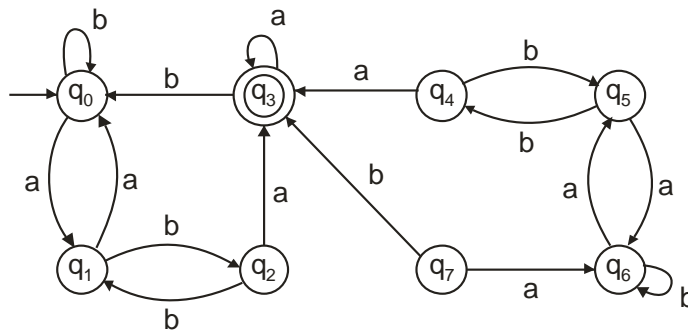
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** questions from each unit.
5. Assume suitable data if necessary.
6. Correct figure indicates the full marks.

### UNIT - I

1. a) Design FSM for binary adder. 10
- b) Construct a deterministic finite automation equivalent to 10  
 $M = (\{q_0, q_1, q_2, q_3\}, \{0, 1\}, \delta, q_0, \{q_3\})$   
where  $\delta$  is given by following table.

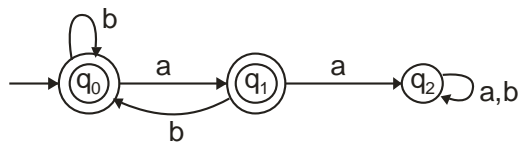
State \ $\Sigma$	a	b
$\rightarrow q_0$	$q_0, q_1$	$q_0$
$q_1$	$q_2$	$q_1$
$q_2$	$q_3$	$q_3$
$\odot q_3$	--	$q_2$

- c) Construct the minimum state automation equivalent to the transition diagram given by 10



## UNIT – II

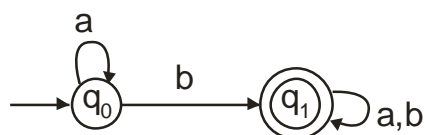
2. a) Construct regular expression for the language accepted by the following transition graph. 10



- b) Construct finite automation equivalent to the regular expression  $(0+1)^*(00+11)(0+1)^*$  10
- c) Show that the set  $L = \{a^{i^2} \mid i \geq 1\}$  is not regular. 10

## UNIT – III

3. a) Consider the following grammar and eliminate useless symbols from it. 10  
 $S \rightarrow AB$   
 $A \rightarrow bC/b$   
 $C \rightarrow bC$   
 $B \rightarrow b$
- b) Reduce the following grammar G to CNF. 10  
 G in  $S \rightarrow aAD, A \rightarrow aB|bAB, B \rightarrow b, D \rightarrow d$ .
- c) Construct regular grammar for following finite automation. 10



## UNIT - IV

4. a) Construct a PDA A accepting the set of all strings over {a,b} with equal no. of a's and b's. **10**
- b) Construct a PDA A equivalent to the following context free grammar **10**  
 $S \rightarrow OBB$   
 $B \rightarrow OS \mid 1S \mid O$   
 Test whether 010000 is accepted by given PDA or not.
- c) Write Markov algorithm to find 1's compliment of a given binary number. **10**

## UNIT - V

5. a) Write short notes on : **10**  
 i) Halting problem.  
 ii) Universal TM
- b) i) Differentiate between FSM and TM. **10**  
 ii) What are the limitations of TM
- c) Construct Turing machine for  $L = \{a^n b a^n \mid n \geq 0\}$ . **10**

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