

Thapar Institute of Engineering & Technology, Patiala
Computer Science & Engineering Department
 B.E. (Computer Engineering) 4th Year 1st Semester
 End Semester Test

Course Code: CS-013
 Course Name: Theory of Computations
 Instructor: Shalini Batra

Date: 05/12/06
 Time Allowed: 3 Hr.
 Max. Marks: 45

Note : Each question carries equal marks .Attempt any five questions.

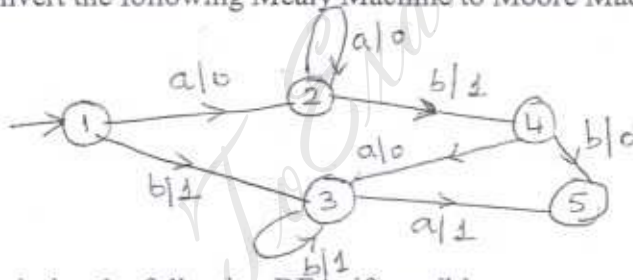
Only first five answers will be evaluated

Make suitable assumptions, with reasoning, if required.

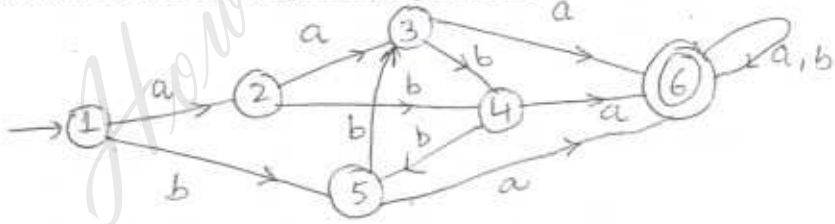
- Q1.a) Give the DFA accepting the following language over the alphabets { 0,1} (no NFA required) (5)

The set of all strings beginning with 1 that , when interpreted as a integer is multiple of 5. For example string 101,1010,1111 are in the language ; 0,100,111 are not .

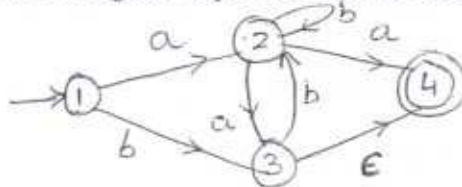
- b) Convert the following Mealy Machine to Moore Machine : (4)



- Q2.a) Minimize the following DFA, if possible :- (3)



- b) Find the regular expression for the following DFA:- (3)



- c) Prove that CFL are closed under union. (3)

Q3a) Check whether the following language is Context free or not :- (3)

$$L = \{ a^i b^j c^k / i < j < k \}$$

b) Convert the following CFG into CNF :- (3)

$$S \rightarrow a S a ; S \rightarrow B ; B \rightarrow b b C ; B \rightarrow b b ; C \rightarrow \epsilon ; C \rightarrow c C$$

c) Find a Context Free Grammar for the following regular expression over the alphabet $\{0,1\}$ (3)

$$(011 + 1)^* (01)^*$$

Q4. a) Draw the TM for the following:- (5)
"All words with odd number of letters that have 'a' as the middle letter"
(Eg. aaa, abaab, bab, etc.)

b) Give the trace for the string abbabba on the machine designed above. (2)

c) Give the rules for finding useless symbols. (2)

Q5.a) Consider the following grammar:- (4)

$$S \rightarrow S + S / S - S / S \times S / S / S / (S) / a$$

(S/S indicate S divide by S)

1. Give the leftmost derivation for string "a + (a x a) / a-a"
2. Give the rightmost derivation for string "a + (a x a) / a-a"
3. Give the parse tree for leftmost and rightmost string derived above.

b) Draw the PDA which accepts the following language:- (4)

"All strings with the same number of a's and b's"

c) Give the language of this CFG : $S \rightarrow aS / bS / a$ (1)

Q6. Write short notes on the following:- (3 X 3)

1. Any three variants of TM
2. ID of a PDA
3. P and NP problems.