

Code No: 155BK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, February - 2022

FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE, IT, ITE)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

- - -

- 1.a) Design a FA for the Language which accepts odd number of 0's and odd number of 1's over input alphabet  $\Sigma = \{0,1\}$ .  
 b) Convert the following NFA into equivalent DFA (figure 1). [7+8]

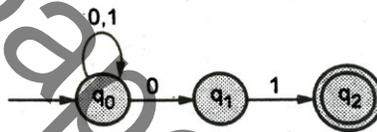


Figure 1

- 2.a) Convert the following NFA with  $\epsilon$  into equivalent NFA without  $\epsilon$  (figure 2).

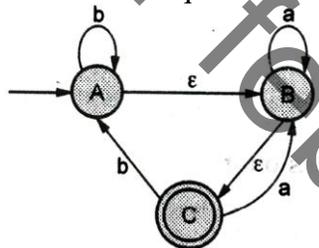


Figure 2

- b) Design a Moore machine to count number of b's in a given input string with a's and b's. [7+8]
- 3.a) Construct the Finite Automata to accept the regular expression  $1^*01(0+11)^*$ .  
 b) Find the minimum state automata for the following DFA (figure 3). [7+8]

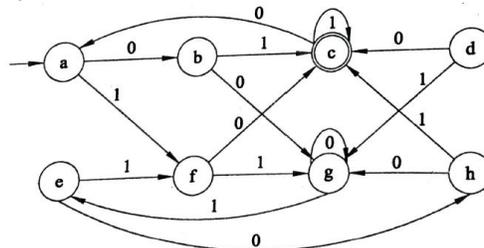


Figure 3

- 4.a) Obtain a regular expression for the following FA (figure 4).

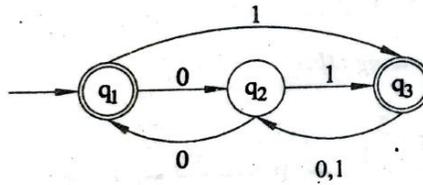


Figure 4

- b) Check whether the following two FSM's are equivalent or not (figure 5)? [7+8]

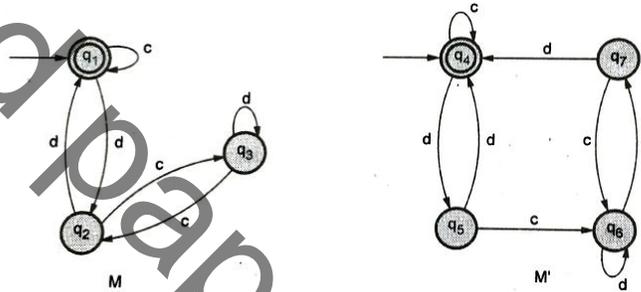


Figure 5

- 5.a) Construct the Context Free Grammar for the Language  $L = \{ 0^{2n}1^m \mid n \geq 0, m \geq 0 \}$   
 b) Construct the CFG for the PDA  $M = (\{q_0, q_1\}, \{0, 1\}, \{R, Z_0\}, \delta, q_0, Z_0, \Phi)$  and  $\delta$  is given by

$$\begin{aligned} \delta(q_0, 1, Z_0) &= (q_0, RZ_0) \\ \delta(q_0, 1, R) &= (q_0, RR) \\ \delta(q_0, 0, R) &= (q_1, R) \\ \delta(q_1, 0, Z_0) &= (q_0, Z_0) \\ \delta(q_0, \epsilon, Z_0) &= (q_0, \epsilon) \\ \delta(q_1, 1, R) &= (q_1, \epsilon) \end{aligned}$$

[7+8]

- 6.a) Design Non deterministic PDA for the language  $L = \{ ww^R \mid w \in (0+1)^* \}$  by empty stack?

- b) Show that the following grammar is ambiguous or not. [7+8]

$$\begin{aligned} S &\rightarrow AB / aaB, \\ A &\rightarrow a/Aa, \\ B &\rightarrow b \end{aligned}$$

- 7.a) Find the GNF equivalent to the following

$$\begin{aligned} S &\rightarrow AA \mid 0 \\ A &\rightarrow SS \mid 1 \end{aligned}$$

- b) Show that  $L = \{ a^n b^n c^n \mid n \geq 0 \}$  is not a context free language. [7+8]

- 8.a) Give an overview of recursively enumerable language.

- b) Obtain the solution for the following post's correspondence problem [7+8]

$$A = \{ 100, 0, 1 \}, B = \{ 1, 100, 00 \}$$