

(3 Hours)

Marks : 80

Note :

1. Question No.1 is compulsory.
2. Attempt any three question from remaining question.
3. Draw suitable diagram whenever necessary.

Q.1:

- a) Construct NFA for accepting the set of all strings over the input $\Sigma = \{0,1\}$, whose second last symbol is 1 (05)
- b) State and explain limitations and power of Finite Automata. (05)
- c) Design a Moore machine for binary number divisible by 3 (05)
- d) Give formal definition of a Push Down automata (PDA) (05)

Q2. a) Convert the following grammar to CNF (10)

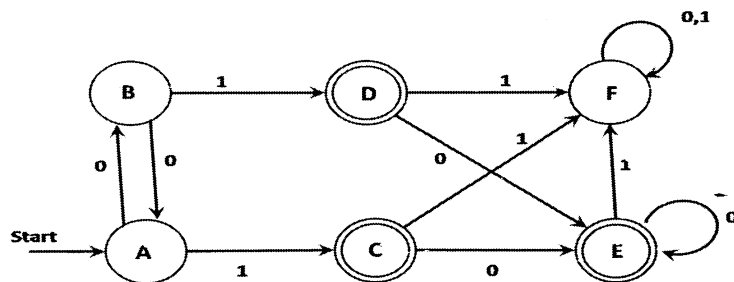
 $S \rightarrow Ba / aB$ $A \rightarrow bAA / aS / a$ $B \rightarrow aBB / bS / b$

b) Design DFA to accept

- i. Binary Strings in which every 0 is followed by 11 (05)
- ii. String over the binary alphabet that do not contain the substring 010 (05)

Q.3:

a) Minimize the following DFA. (10)



- b) Convert the following NFA to DFA(final state is marked with *) (10)

δ	0	1
p	p,q	p
q	r	r
r	s	---
*s	s	s

Q.4:

- a) Design PDA for recognizing $L = \{a^n b^m a^n \mid m, n \geq 1\}$ (10)

- b) Design a Turing Machine to recognize the language $L = \{a^n b^n a^n \mid n \geq 1\}$ (10)

Q.5:

- a) Using the pumping Lemma prove that the following language is not regular
 $L = \{ww \mid w \in \{0, 1\}^*\}$ (10)

- b) Design Melay machine to accept all the strings ending with 00 or 11 (10)

Q.6: Write a Short Note on (any four) (20)

- Chomsky Hierarchy.
- Applications of Automata theory
- Universal Turing Machine
- Post correspondence Problem
- Halting Problem