Theoretical Computer Science

JUNE 19

Computer Engineering (Semester 5)

Total marks: 80
Total time: 3 Hours

INSTRUCTIONS
(1) Question 1 is compulsory.
*(2) Attempt any **three** from the remaining questions.*
(3) Draw neat diagrams wherever necessary.

1.a. Differentiate DFA and NFA.   (5 marks)

1.b. Design a DFA to accept string of 0"s and 1"s ending with the string 100.   (5 marks)

1.c. Explain the applications of Regular Expressions.   (5 marks)

1.d. What are Recursive and Recursively Enumerable Languages?   (5 marks)

2.a. Design NFA for recognizing the strings that end in "aa" over Σ={a,b} Σ={a,b} & convert above NFA to DFA.   (10 marks)

2.b. Design Moore m/c for following: - If input ends in '101' then output should be A, if input ends in '110' output should be B, otherwise output should be C and convert it into mealy m/c.   (10 marks)

3.a. Obtain a regular expression for the FA shown below: (10 marks)
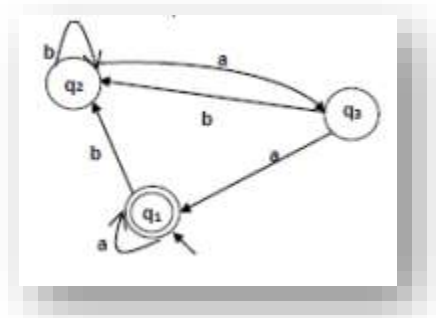
3.b. Explain the types of Turing machine in detail. (10 marks)

4.a. Design a Turing machine that computes a function f(m,n) = m+n
i.e. addition of two integers. (10 marks)

4.b. State and explain pumping Lemma for Context Free Languages. Find out whether the
language L={xnynzn|n≥1}L={xnynzn|n≥1} is context free or not. (10 marks)

5.a. Design PDA for the following language:
L(M)={wcwR|w{a,b}∗} L(M)={wcwR|w{a,b}∗} where wRwR is reverse
of w & c is a constant. (10 marks)

5.b. Convert the following Grammars to the Chomsky normal form (CNF).
S→0A0|1B1|BB
A→C
B→S|A
C→S|ε (10 marks)

Write detailed note on any two.

6.a. Post Correspondence Problem (10 marks)

6.b. Halting Problem. (10 marks)

6.c. Rice's Theorem. (10 marks)