53 (CS 502) THCP

2018

THEORY OF COMPUTATION

Paper : CS 502

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

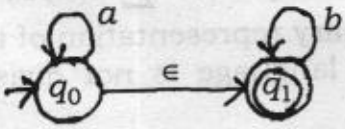
*Answer **any five** questions.*

1. *(a)* What do you mean by language accepted by DFA ?

   (b) Language accepted by a PDA is ..... *(type-0, type-1, type-2, type-3)* language.

   (c) Define null string.

   Consider the following diagram and answer questions *(d)* – *(h)*



(d) What is the minimum string accepted by the above automata ?

(e) What is the language accepted by the above diagram ?

(f) Write a regular-expression for the language accepted by the above diagram.

(g) Write a grammar for the language accepted by the above diagram.

(h) Is this diagram is DFA ? Explain your answer.

(i) Palindrome is the example of ..... *(Regular, Context free)* language.

(j) Pumping lemma is used for .....

$2 \times 10 = 20$

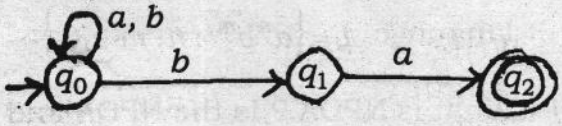
2. Draw the DFA (or NFA) for the languages : $7+7+6$

(a) Over the alphabet $\sum = \{a, b\}$ such that all the strings of that language start with '*a*' and end with '*b*'.

(b) Over the alphabet $\sum = \{0, 1\}$ such that the binary representation of the strings of the language is not divisible by 5 (five).

(c) Prove that, if a language is regular then its complement is also regular.

3. (a) Convert the following NFA to its equivalent DFA.



(b) Write a regular expression of the language

$$L=\{W \in \{a, b\}^* : |w| = odd\}$$

(c) Constract a NFA for the regular expression $r=(a+b^*)^*$. 7+7+6

4. (a) State the Pumping lemma for the regular language. Using pumping lemma prove that the language $L=\{a^n b^n : n \geq 0\}$ is not regular.

(b) Explain how a language is recognised by a PDA. What is the role of stack in PDA ?

10+10

5. (a) Write a grammar for the language

$$L=\{a^n b^m : n < m\}$$

(b) What is ambiguous grammar ? Explain with suitable example.

10+10

6. (a) Define PDA. Design a PDA for the language $L=\{a^n b^m : n, m \geq 0\}$.

(b) What is NPDA ? Is the NPDA and DPDA are equivalent (explain) ?

10+10

7. Write the short notes on : 4×5

(a) Turing Machine

(b) Turing Thesis

(c) Recursive language

(d) Language hierarchy.