

Code No: 5405AQ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech II Semester Examinations, December – 2018/January - 2019

THEORY OF COMPUTATION

(Computer Science)

Time: 3hrs

Max.Marks:75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A****5 × 5 Marks = 25**

- 1.a) Define Finite automata. Also Define computation. Give examples. [5]
- b) What is Context free grammar? Give Examples. [5]
- c) Discuss the variants of Turing machine. [5]
- d) Discuss decidability. [5]
- e) Discuss P and NP problems. [5]

**PART - B****5 × 10 Marks = 50**

- 2.a) Differentiate between DFA and NFA.
- b) Draw DFA which accepts even number of a's over the alphabet {a, b}. [5+5]

**OR**

3. Construct the NFA for the language which accepts all and only the strings of 0's and 1's that end in 01. Obtain the equivalence DFA for it. [10]

4. Construct a context free grammar which accepts  $N(A)$  where A is  $(\{q_0, q_1, q_2\}, \{a, b, c\}, \{a, b, z_0\}, \delta, q_0, z_0, q_2)$

where  $\delta$  is given by

$$\delta(q_0, a, z_0) = (q_0, az_0)$$

$$\delta(q_0, b, z_0) = (q_0, bz_0)$$

$$\delta(q_0, a, a) = (q_0, aa)$$

$$\delta(q_0, b, a) = (q_0, ba)$$

$$\delta(q_0, a, b) = (q_0, ab)$$

$$\delta(q_0, b, b) = (q_0, bb)$$

$$\delta(q_0, c, z_0) = (q_1, z_0)$$

$$\delta(q_0, c, a) = (q_1, a)$$

$$\delta(q_0, c, b) = (q_1, b)$$

$$\delta(q_1, a, a) = (q_1, \epsilon)$$

$$\delta(q_1, b, b) = (q_1, \epsilon)$$

$$\delta(q_1, \epsilon, z_0) = (q_2, z_0)$$

[10]

**OR**

5. Give a grammar in Chomsky Normal Form that generates the same language as the grammar  $G = (V, \Sigma, R, S)$  with  $V = \{S, X, Y\}$ ,  $\Sigma = \{a, b, c\}$ , and  $R$  being the following set of rules:

$S \rightarrow XY$

$X \rightarrow abb \mid aXb \mid \epsilon$

$Y \rightarrow c \mid cY.$

[10]

- 6.a) How to design Turing machines? Discuss.

- b) What are the components of Turing machines and give description of Turing Machines.

[5+5]

**OR**

7. Construct the Turing machine that accepts all a's and b's such that number of a's is equal to number of b's.

[10]

8. Discuss the decidable problems concerning

a) Regular languages

b) Context free languages.

[5+5]

**OR**

9. Describe mapping reducability.

[10]

10. Discuss cook Levin Theorem.

[10]

**OR**

11. Discuss vertex cover problem.

[10]

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