

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- Oct 2017

B.Tech. V Semester

COURSE CODE: 10B11CI513

MAX. MARKS: 25

COURSE NAME: Theory of Computation

COURSE CREDITS: 04

MAX. TIME: One Hour Thirty Minutes

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

1. Consider the following grammar (the start symbol is S; the alphabets are implicit in the rules): [4 Marks]

$$S \rightarrow SS \mid AAA \mid \epsilon$$

$$A \rightarrow aA \mid Aa \mid b$$

- (a) Describe the language generated by this grammar.  
 (b) Give a left-most derivation for the terminal string abbaba.  
 (c) Show that the grammar is ambiguous by exhibiting two distinct derivation trees for some terminal string
2. Construct a Context Free Grammar for the language given below: [4 Marks]

$$L = \{a^m b^{2n} c^{3n} d^p \mid p > n, \text{ and } m, n \geq 1\}$$

3. Simplify the following context free grammars [6 Marks]

$$\text{a) } S \rightarrow ABaC, A \rightarrow BC, B \rightarrow b \mid \epsilon, C \rightarrow D \mid \epsilon, D \rightarrow d$$

$$\text{b) } S \rightarrow Aa \mid N, A \rightarrow a \mid bc \mid B, B \rightarrow A \mid bb$$

4. Construct a pushdown automaton machine accepting the language [6 Marks]

$$\text{a) } L = \{a^n b^m \mid 2n = 3m, n \geq 0, m \geq 0\}.$$

$$\text{b) } L = \{a^i b^j c^k \mid i, j, k \geq 0, i+k=j\}$$

5. Consider a Non Deterministic Push Down automata machine  $M = (\{q_0, q_1, q_2\}, \{a, b\}, \{a, b, z_0\}, \delta, q_0, \{q_0\})$ . Explain the language accepted by given Push Down automata and construct the diagram corresponding to the given PDA. [5 Marks]

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

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

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

$$\delta(q_1, b, z_0) = (q_1, z_0)$$

$$\delta(q_2, a, z_0) = (q_0, z_0)$$

$$\delta(q_2, b, z_0) = (q_2, z_0)$$

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

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