

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech- Vth Semester (CSE/IT/ECE/CE/BT/BI)

COURSE CODE (CREDITS): 18B11CI513 (3)

MAX. MARKS: 35

COURSE NAME: Formal Languages and Automata Theory

COURSE INSTRUCTORS: RKL,DHA,SGL,VKS

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. (i) Create a DFA for a language L and the alphabet set contains a and b, which has exactly two a's and an odd number of b's.

(ii) Create a Context free grammar which accepts a language $L = \{a^n b^m c^k \text{ such that } m \neq k \text{ and } n \geq 0, m \geq 0 \text{ and } k \geq 0\}$

[2.5+2.5] [CO2,CO6]

Q2. (i) Check if a given string abbaa is accepted by the below grammar with CYK algorithm. Assume S as the start symbol.

$S \rightarrow XY, X \rightarrow SY, X \rightarrow a|bb \text{ and } Y \rightarrow a$

(ii) Explain can we create a parse tree with some modification of CYK algorithm. [4+1] [CO7]

Q4. (i) Convert below Context free grammar to Push down automata. Draw the state diagram of the PDA. Consider S is starting variable. X and Y are non terminals and a,b are terminals.

$S \rightarrow XY, X \rightarrow aY, Y \rightarrow a|bb$

(ii) How is push down automata more powerful than FSM. Justify your answer. [4+1] [CO7]

Q5. Prove that $L = \{ww \text{ such that } w \text{ belongs to } (a, b)^*\}$ is not context free by pumping lemma.

[5][CO5]

Q6. (i) Convert $S \rightarrow AB, A \rightarrow BS|b \text{ and } B \rightarrow SA|a$ to Greibach normal form.

(ii) What is the application of Greibach normal form?

[4+1][CO5]

Q7. Design a Turing machine for the $L = \{wCw \text{ such that } w \text{ belongs to } (a, b)^*\}$.

[5] [CO8]