

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION-2022

B.Tech-III Semester (CS/IT/ECE/Civil/BT)

COURSE CODE (CREDITS): 18B11CI513 (3)

MAX. MARKS: 35

COURSE NAME: Formal Languages and Automata Theory

COURSE INSTRUCTORS: Dr. (Amit, Shubham, Vipul, Rakesh, Yugal)

MAX. TIME: 2 Hrs

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

- Q1. Suppose that Finite Automaton is working as a Transducer then show the process of getting Two's complement of a given binary sequences with a proper machine [Reading can be done from any side of Input sequence]. For ex: 01011000 will be converted into 10101000. [CO-3] [5]
- Q2. The power of CFG and NPDA is same; it means that we have a way to convert from one form to another form. So, convert the following CFG into equivalent PDA: $S \rightarrow aTb|b$; $T \rightarrow Ta/\text{null}$. [CO-6] [5]
- Q3. As we know the power of Turing Machine is equivalent with Digital Computers, so design a Turing Machine to divide the two numbers and find the remainder of it. For ex. $10/3$; gives remainder = 1. [CO-7] [8]
- Q4. Prove that Halting problem is undecidable. [CO-8] [5]
- Q5. Define a Turing machine by specifying function of each part of it. Design a Multi-Tape Turing Machine to accept the language $L = \{0^n 1^n 2^n \mid n \geq 1\}$ in a non-destructive way. [CO-9] [5]
- Q6. Draw a comparative table that contains the followings (in a single row) for all the languages we studied in this course: [CO-10] [7]
- Grammars
 - Languages
 - Deterministic
 - Non-Deterministic
 - Closed under operations
 - Decidable
 - Un-decidable