

Pandit Deendayal Petroleum University

End Semester Examination

B. Tech. (CSE)

Semester - IVCourse Name : Theory of Computation
Course Code : 20CP206TDate: 09/05/2022
Time: 10 AM – 12 PM
Max. Marks: 40**Instructions:**

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever essential and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics wherever required is an integral part of the answer.

Part-A**ANSWER ALL THE QUESTIONS**

Question No.	Description	Marks	Course Outcome (CO)
Que-1	Construct Finite Automata for following Regular Expression (a) $0^*1(1+00^*1)^*$ (b) $(0+1)^*1$ (c) $0^*1^*1 + 11^*1$ (d) $((0+1)(0+1))^*$	10	CO2
Que-2	a. Show the context-free languages are closed under union, concatenation and Kleene closure but not closed under intersection and complementation. b. Let G be the grammar $S \rightarrow aB/bA$, $A \rightarrow a/aS/bAA$, $B \rightarrow b/bS/aBB$. Obtain all the possible parse tree for the string 'aaabbabbba'.	5 5	CO3 CO4
Que-3	Simplify the following grammar $S \rightarrow aAa bBb BB$ $A \rightarrow C$ $B \rightarrow S A$ $C \rightarrow S \epsilon$ Remove ϵ , unit production and further remove useless production.	5+5	CO5

Part-B

ANSWER ANY ONE QUESTION (10 Marks)

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| Que-4 | a. Design a Turing machine for the language
$L=\{1^n0^n1^n n \geq 1\}$ | 5 | CO6 |
| | b. Give 3 examples for NP-complete problems and explain. | 5 | CO3 |

OR

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| Que-4 | a. In what circumstances, we can say $P=NP$ and $P \neq NP$. Please explain? | 2.5 | CO5 |
| | b. Show that languages are uncountable sets and Turing machines (TMs) are countable. | 2.5 | CO5 |
| | c. Design an LBA for the language $L=\{WW/W \in \{a,b\}^*\}$ | 5 | CO6 |