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Department/ School: SCSET

END-TERM EXAMINATION, ODD SEMESTER DECEMBER 2024

COURSE CODE: CSET 302
COURSE NAME: Automata Theory and Computability
PROGRAM: B.Tech

MAX. DURATION 2 HRS

TOTAL MARKS 40

Mapping of Questions to Course and Program Outcomes						
Q.No.	A1	A2	A3	B1	B2	B3
CO	2	1	1	2	1	3
PO	1-3	1,2	1,2	1-3	1, 2	1, 2
BTL	4	3	2	4	2	3

GENERAL INSTRUCTIONS: -

- Do not write anything on the question paper except **name, enrolment number** and **department/school**.
- Carrying mobile phones, smartwatches and any other non-permissible materials in the examination hall is an act of **UFM**.

COURSE INSTRUCTIONS:

- Attempt all question from each section.

SECTION A

[3Q X 5 Marks = 15 Marks]

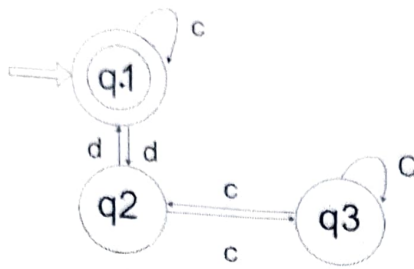
A1) Design a minimal DFA for language $L = \{ w \mid n_b(w) \bmod 5 < 2 \}$ over alphabet $\Sigma = \{a, b\}$. Where n_b represents number of b's in string "w". **[5 Marks]**

A2) Construct the Context Free Grammar for the following language. Also check the ambiguity of the grammar. **[5 Marks]**

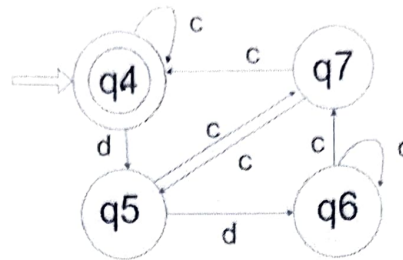
I. $L = \{ a^m b^n \mid m, n \geq 1 \text{ and } m \neq n \}$

II. $L = \{ a^m b^n c^l \mid m, n \geq 1 \text{ and } m + n = \text{odd} \}$ and $l \geq 0$

A3) Find out whether two different automata shown in below figure are equivalent or not by detailing the steps used. **[5 Marks]**



AUTOMATON-1



AUTOMATON-2

SECTION B

[2Q X 10 Marks + 1Q X 5 Marks = 25 Marks]

- B1)** Construct a TM for the language $L = \{a^n b^n c^n | n \geq 1\}$ over alphabet over $\Sigma = \{a, b, c\}$. [10 Marks]
B2) What are the halting state for the above TM for the following inputs. Also show all the transitions used to check the halting state. [5 Marks]

I. abbcc

II. aabcc

- B3)** Construct PDA that accepts the language $L = \{a^m b^n | m = n \text{ or } 2m = n, n, m \geq 1\}$ over $\Sigma = \{a, b\}$.

[10 Marks]

-ALL THE BEST-