BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

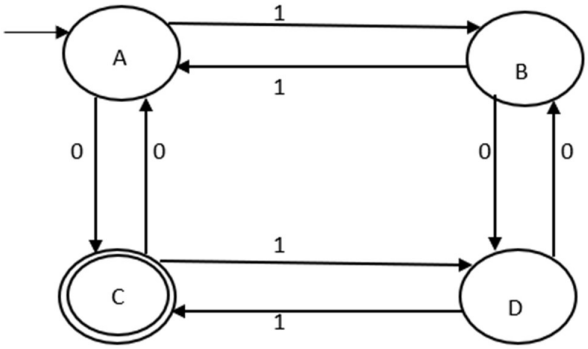
CLASS: IMSc **SEMESTER : V**
BRANCH: IMH **SESSION : MO/2024**

SUBJECT: CS310 FORMAL LANGUAGE AND AUTOMATA THEORY

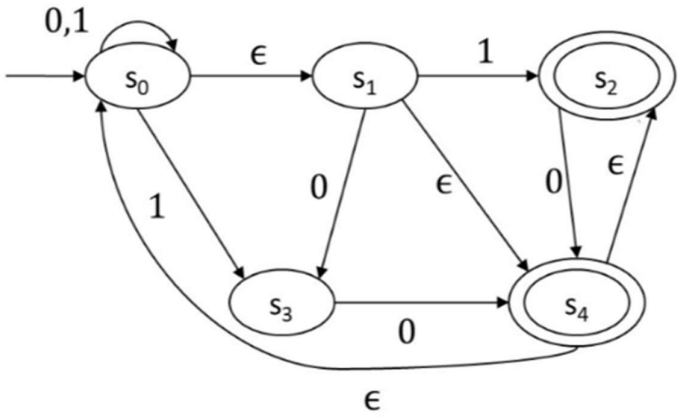
TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Give a formal definition of non-deterministic finite automaton with example.	[2]	1	2
Q.1(b)	Construct a DFA over {0, 1} that accepts all strings of length divisible by 4. Show its transition table.	[3]	1	4
Q.2(a)	Write the language that is accepted by the following DFA. Also write the language if we change the final state from C to D.	[2]	1	3,4



Q.2(b)	Differentiate Kleene Closure and positive closure. Find ϵ-closure of each state of the following NFA.	[3]	1,2	2,4



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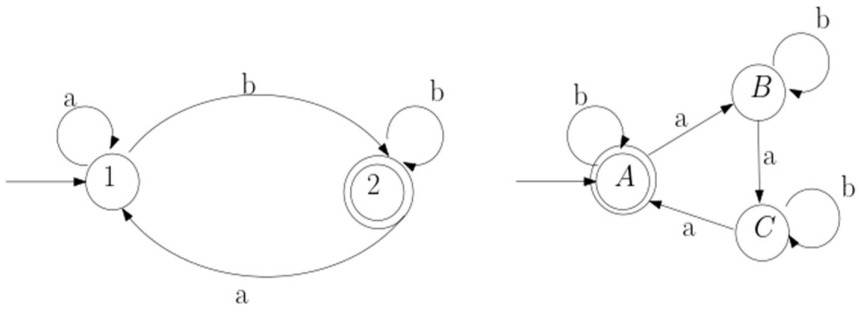
Q.3 Construct a minimal DFA by intersecting the following two DFAs D1 and D2. [5] 1 5



(D1) (D2)

Q.4 Convert the NFA of the given transition table to its equivalent DFA. Explain every step clearly and draw the obtained DFA. Consider 0 as the initial state and 4 as the final state. [5] 1 5

States	a	b
0	1, 2, 3	2, 3
1	1, 2	2, 3
2	ϕ	2, 3, 4
3	4	2, 3, 4
4	ϕ	ϕ

Q.5(a) Write regular expression for the given language: [1] 2 4
$L = \{a^m b^n \mid m+n \text{ is odd}\}$

Q.5(b) Construct a DFA for the strings over {0, 1} that does not contain substring '001' and write the regular expression of the language. Show all the steps clearly. [4] 1,2 5

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