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Minor CERTIFICATION EXAMINATION, NOVEMBER 2023

Third Semester

18CSE004T - FORMAL LANGUAGE AND AUTOMATA

(For the candidates admitted during the academic year (2020-2021 & 2021-20222))

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

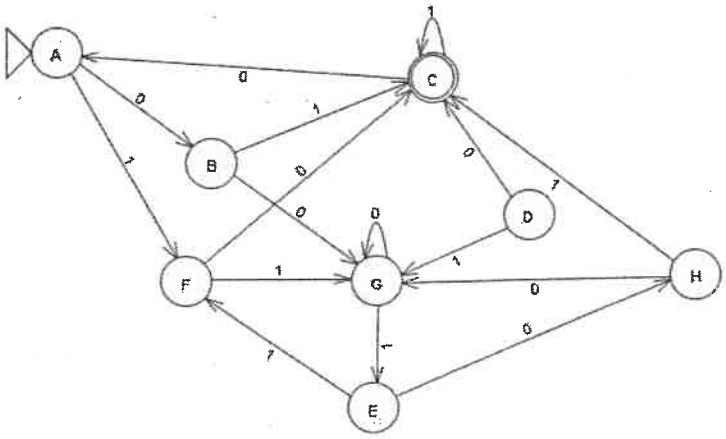
		Marks	BL	CO
1.	Devices with a finite amount of memory which is used to model "small" computers. (A) finite automata (B) push-down automata (C) Turing machine (D) Linear bounded automata	1	1	1
2.	Which of the following belongs to union operation? (A) r1.r2=r1r2 (B) r1+r2 (C) r1* (D) r1+	1	1	1
3.	Deterministic Finite Automata means (A) multiple paths exists from current state to next state for a particular input (B) two path exists from current state to next state for a particular input (C) one path exists from current state to next state for a particular input (D) three path exists from current state to next state for a particular input	1	2	1
4.	Kleen closure produces (A) Zero or more number of inputs (B) Zero input (C) One input (D) one or more number of inputs	1	2	1
5.	How many components are available in the definition of grammar (A) 3 (B) 2 (C) 1 (D) 4	1	1	2
6.	Type 3 Grammar represents (A) Regular Grammar (B) context sensitive grammar (C) context free grammar. (D) unrestricted grammar	1	1	2
7.	The input is scanned and replaced with the production rule from left to right. (A) Right most Derivation (B) Left most Derivation (C) Shortest Derivation (D) Fastest Derivation	1	2	2
8.	A grammar is said to be _____ if there exists more than one leftmost derivation or more than one rightmost derivation or more than one parse tree for the given input string. (A) ambiguous (B) non-ambiguous (C) rightmost derivation (D) leftmost derivation	1	2	2
9.	Pushdown Automata contains memory in the point of (A) Queue (B) Stack (C) Linked List (D) Array	1	1	3
10.	Pushdown automata accepts _____ (A) context sensitive grammar (B) regular grammar (C) context free grammar (D) unrestricted grammar	1	1	3

11.	By default pushdown automata is (A) nondeterministic (B) deterministic (C) centralized (D) decentralized	1	2	3
12.	Pushdown automata cannot process the string in (A) last in first out order (B) first in last out order (C) random order (D) sequence order	1	2	4
13.	Turing machine was invented by (A) Charles Babbage (B) Alan Turing (C) Einstein (D) Edison	1	1	5
14.	Turing machine can process the input in (A) left to right (B) right to left (C) Both left to right and right to left (D) non generating symbol	1	1	5
15.	Turing Machine has (A) bounded in left side (B) bounded in right side (C) bounded in both sides (D) no boundaries	1	2	5
16.	Turing machine accepts (A) context free grammar (B) context sensitive grammar (C) regular grammar (D) all the above as it is called as unrestricted grammar	1	2	4
17.	The turing machine has accepted the input, comes under (A) recursive language (B) recursive enumerable language (C) regular language (D) context free language	1	1	6
18.	In closure properties of recursive language, If L is recursive then L' is (A) non recursive (B) recursive (C) regular (D) context free	1	1	6
19.	Any non-trivial property of R.E languages is (A) decidable (B) undecidable (C) closure (D) kleen closure	1	2	6
20.	The Post Correspondence Problem (PCP), introduced by Emil Post in 1946, is (A) decidable problem (B) recursive problem (C) undecidable problem (D) accepted problem	1	2	6

		Marks	BL	CO
	PART - B (5 × 4 = 20 Marks) Answer **any 5** Questions			
21.	Convert the given NFA to DFA. Let M= ({q0, q1}, {0, 1}, δ, q0, {q1}) be NFA, where δ(q0,0)={q0,q1}, δ(q01)={q1}, δ(q1,0)=ϕ, δ(q1,1)={q0,q1}	4	3	1
22.	Prove the language of prime number is not regular by using pumping lemma	4	3	1
23.	Analyze the steps involved in removing the ambiguity in a grammar with an example	4	4	2
24.	Convert the given CFG to PDA S→aBB, B→bS|c	4	3	3
25.	Write short notes on Instantaneous Description of push down automata with an example.	4	2	4
26.	Draw a Turing Machine to perform 2's Complement.	4	3	5
27.	Whether NP-hard and NP-Complete provide solutions? Justify.	4	4	6

		Marks	BL	CO
	PART - C (5 × 12 = 60 Marks) Answer **all** Questions			

28. (a) Construct the minimum finite state automata for the following DFA. 12 3 1



(OR)

(b) Construct NFA for the R.E =(a(aa)*b+ab*a) *

29. (a) Convert the following CFG to Chomsky normal form: 12 3 3

S→A/B/C

A→aAa/B

B→bB/bb

C→baD/abD/aa

D→ aCaa/D

(OR)

(b) Convert the following to Greibach Normal Form

S→AB

A →BS|b

B →SA|a

30. (a) Design a Push Down Automata which accepts the set of balanced parenthesis ({{()}}) 12 3 4

(OR)

(b) Draw a Push Down Automata which accepts L = $\{a^n b^n / n>1\}$

31. (a) Sketch a Turing Machine to perform multiplication. 12 3 5

(OR)

(b) Design a Turing Machine to perform division.

32. (a) Analyze Rice theorem in the construction of Turing Machine reduction 12 4 5

(OR)

(b) Justify Post Correspondence Problem is undecidable with suitable example.

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