National Institute of Technology
Tiruchirappalli, Tamil Nadu – 620 015

CSPC31: Principles of Programming Languages – CT I   **Date: 19.09.2022**

Duration: 1 Hour

Time: 04:00 – 05:00 PM

Total Marks: 20

Note: *MCQ may have multiple answers. In such case, you have to write all the correct choices. Otherwise, mark will not be awarded for that question.*

1. Using the following grammar and table, check whether the string **id + (id)** will be accepted or not: **(4 M)**

   1. E → E + T
   2. E → T
   3. T → (E)
   4. T → id

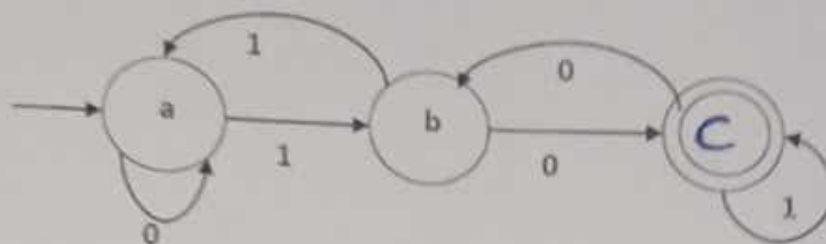| State	Action					Goto	
	id	+	(	)	$	E	T
0	S4		S3			1	2
1		S5			Accept		
2	R2	R2	R2	R2	R2		
3	S4		S3			6	2
4	R4	R4	R4	R4	R4		
5	S4		S3				8
6		S5		S7			
7	R3	R3	R3	R3	R3		
8	R1	R1	R1	R1	R1		

2. What operation does the operator +.x do?   **(1 M)**

   (a) Addition Operation only

   (b) Multiplication Operation only

   (c) Addition followed by Multiplication

   (d) Multiplication followed by Addition

3. (i) State whether the following diagram is NFA or DFA.   (1 M + 2 M)

(ii) Which of the following sentences are generated by the automaton given in 3 (i)?

(a) 00000110000   (b) 110000011   (c) 01100000011   (d) None of the above

4. (i) For the statement, **123.55*2*e^+10** derive the leftmost derivation and corresponding parse tree using the following grammar.   (5 M + 3 M)

    digit → 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

    digits → digits digit

        | digit *

        | digit

    optionalFraction → . digits * digits

    optionalExponent → e ^+ digits

        | e ^− digits

    number → digits optionalFraction optionalExponent

(ii) Is the grammar given in 4 (i) left recursive? If yes, write the name of the left recursion and also rewrite the particular rule without left recursion.

5. (i) What is the output of lexical analyzer called?   (1 M + 3 M)

(ii) What outputs are generated by lexical analyzer while parsing the following two statements?

    [*Hint:* Consider d, e, f and g are all integer datatypes; _ represents Space character]

    (a) int_d_=_e_+_f_*_ _ _ _g;   // Assignment Operation

    (b) printf_(_"HelloHowAreYou"_)_;   //Print Statement

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