BCA Semester-IV (Hons.) Examination, 2022-23

BACHELOR OF COMPUTER APPLICATION

Course ID : 43313 **Course Code : CC-10**

Course Title : Theory of Computation

Time : 2 Hours Full Marks : 50

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

GROUP–A

1. Choose the best alternative from the following options for each questions: 1×10=10

   i) The language that a push down automation accepts in which the stack stays limited to about 10 items is describe best as:

   a) Recursive

   b) Deterministic Context Free

   c) Regular

   d) Context free

   e) None of the above

   ii) Moore machine is an application of:

   a) Finite automata without input

   b) Finite automata with output

   c) Non-finite automata with output

   d) Non-finite automata without input

   e) None of the above

   iii) Given: $L_1 = \{x \varepsilon \Sigma^* | x$ contains even no's of 0's$\}$

   $L_2 = \{x \varepsilon \Sigma^* | x$ contains odd no's of 1's$\}$

   No of final states in language $L_1 \cup L_2$?

   a) 1

   b) 2

   c) 3

   d) 4

   e) None of the above

   iv) If we consider an arbitrary NFA with N states in total, the maximum number of states that are there in an equivalent DFA is at least-

   a) N!

   b) 2N

   c) N^2

   d) 2^N

   e) None of the above.

v) How many states are presents in DFA constructed to accept "the set of all strings ending in 010"?

a) 3

b) 4

c) 5

d) 6

e) None of the above

vi) The logic of pumping lemma is a good example of:

a) Pigeon–Hole principal

b) Divide and Conquer technique

c) Recursion

d) Iteration

e) None of the above

vii) Context Free grammar can be recognized by:

a) Finite state automation

b) 2 -way linear bounded automata

c) Push down automata

d) Both ‘b’ and ‘c’

e) None of the above

viii) Which of the following is not a sequential circuit?

a) Flip flop

b) Counter

c) Shift register

d) Encoder

e) None of the above

ix) Consider that we have a G ambiguous grammar along with its D disambiguated version. If the language that is recognized by these two grammars is denoted by L (G) and L (D), then which one of this will be true?

a) L (D)= L (G)

b) $L(D) \subset L(G)$

c) L (D) is empty

d) $L(D) \supset L(G)$

e) None of the above

x) Which one of these given regular expression isn't equivalent to this regular expression: (m+n+o)*?

a) (m*n*+o*)*

b) ((mn)*+o*)*

c) (m*n*o*)*

d) (m*+n*+o*)*

e) None of the above

GROUP–B

2. Answer any **five** questions: 2×5=10

i) Define finite automata.

ii) What do you mean by language? Explain it with example.

iii) Define left linear grammar.

iv) Define NPDA.

v) "The set of all odd integers is a monoid under multiplication"- Test whether the statement is true or false? Justify your answer.

vi) What do you mean by Moore machine? Explain with example.

vii) What do you mean by degree of a graph?

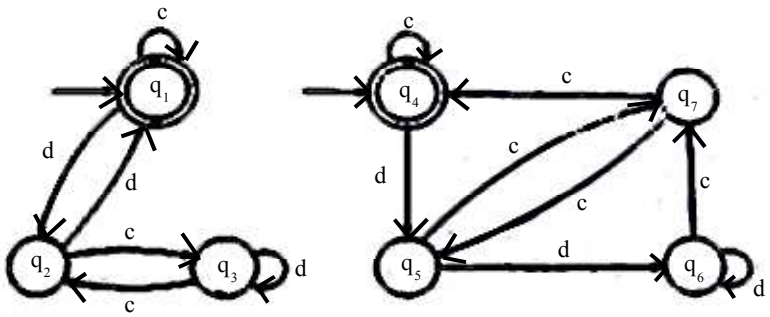
viii) Explain terminal and non-terminal symbol of a grammar.

GROUP–C

3. Answer any **four** questions: 5×4=20

i) Show that L = $\{a^p | p \text{ is a prime}\}$ is not regular.

ii) Show that M_1 and M_2 defined by the figure below are not equivalent.



(a) (b)

Here (a) automaton M_1 and (b) automaton M_2.

iii) Construct a minimum state automaton equivalent to a DFA whose transition table is given below: ($*q_3$ and $*q_4$ indicates that final states)

States	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_4	q_3
q_2	q_4	q_3
$*q_3$	q_5	q_6
$*q_4$	q_7	q_6
q_5	q_3	q_6
q_6	q_6	q_6
q_7	q_4	q_6

iv) Write a short note on recursive and recursively enumerable sets.

v) Define ambiguous grammar. Show that the following grammar is ambiguous: $S \rightarrow aSbS| bSaS|\varepsilon$

vi) Construct a NFA to accept strings of a's and b's having substring aba.

GROUP–D

4. Answer any **one** question: 10×1=10

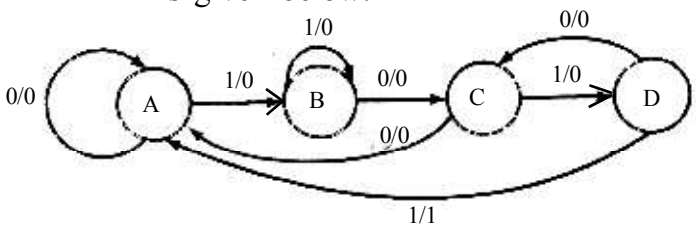
i) a) Explain the block diagram of PDA with its components specification, language and transition table.

b) Draw FA for the following regular expression: 7+3

(a+b)*(ab)*

ii) a) Show that L = $\{a^p|$ p is a prime$\}$ is regular.

b) Design a sequence detector that produces an output '1' whenever the non over lapping sequence 1011 is detected. The state diagram is given below: 3+7



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