BRAINWARE UNIVERSITY

Term End Examination 2022
Programme – B.Tech.(CSE)-2018/B.Tech.(CSE)-2019/B.Tech.(CSE)-2020
Course Name – Formal Language and Automata Theory
Course Code - PCC-CS503
(Semester V)

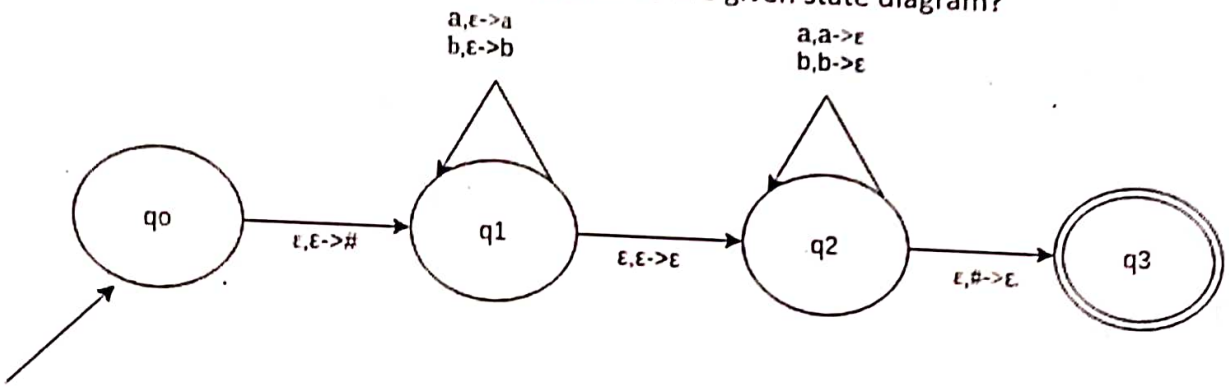
Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question)

1. *Choose the correct alternative from the following :* 1 x 15=15

(i) Select which of the following correctly resembles the given state diagram?



a) $\{ww^r | w=(a+b)^*\}$
b) ε is called the initial stack symbol
c) All of the mentioned
d) None of the mentioned

(ii) Justify, A language is accepted by a push down automata if it is:
a) regular
b) context free
c) both regular AND context free
d) none of the mentioned

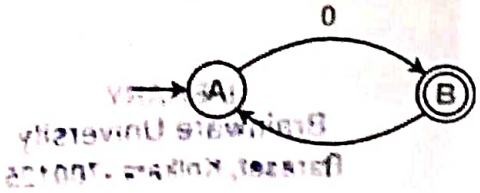
(iii) Choose which of the following statements are correct for a concept called inherent ambiguity in CFL?
a) Every CFG for L is ambiguous
b) Every CFG for L is unambiguous
c) Every CFG is also regular
d) None of the mentioned

(iv) _____ produces the acyclic graphical representation of a grammar
a) Binary tree
b) Oct tree
c) Parse tree
d) None of the mentioned

(v) Choose which of the following are always unambiguous?
a) Deterministic Context free grammars
b) Non-Deterministic Regular grammars
c) Context sensitive grammar
d) None of the mentioned

(vi)

Find the regular expression of the following finite automata.



a) (0+1)(01)*
b) 0(01)*
c) 0(10)*
d) none of these

(vii) Which among the following is true for the given statement? Statement :If there are strings R and T in a language L so that R is prefix of T and R is not equivalent to T.

a) No DPDA can accept L by empty stack
b) DPDA can accept L by an empty stack
c) L is regular
d) None of the mentioned

(viii) Halting states are of two types. They are:

a) Accept and Reject
b) Reject and Allow
c) Start and Reject
d) None of the mentioned

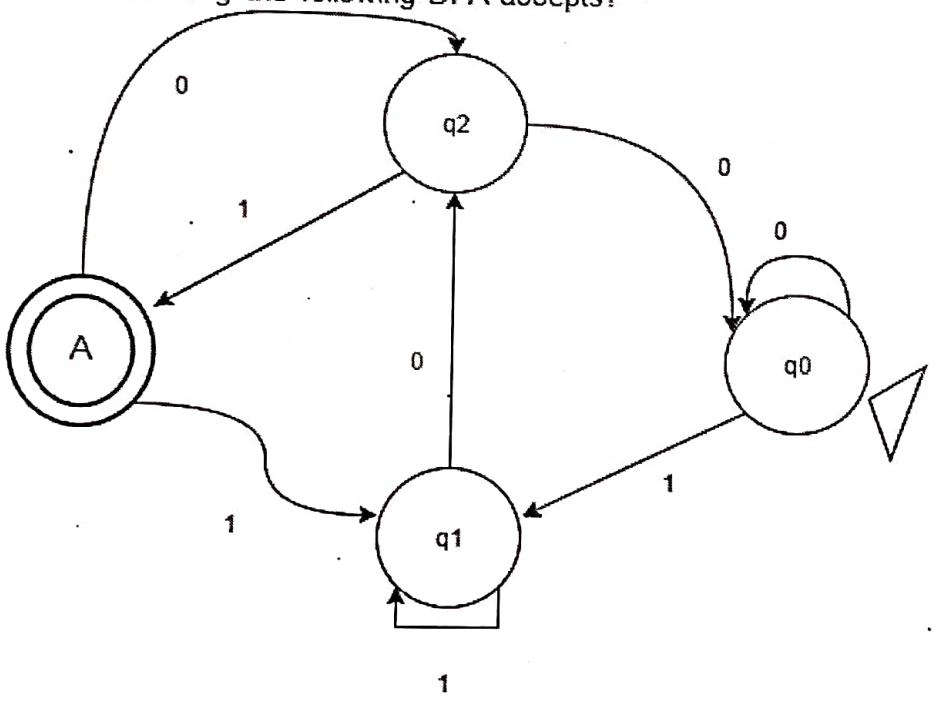
(ix) Select the Number of states require to accept string ends with 101

a) 3
b) 4
c) 2
d) cann't be represented

(x) Define whether a DFA recognize a palindrome number?

a) Yes
b) No
c) Yes, with input alphabet as a*
d) Cann't be determined

(xi) Select the string the following DFA accepts?



a) x is a string such that it ends with '101'
b) x is a string such that it ends with '01'
c) x is a string such that it has odd 1's and even 0's
d) x is a strings such that it has starting and ending character as 1

(xii) Given grammar G: S->aS| AB A-> epsilon B-> epsilon D-> b Reduce the grammar, removing all the epsilon productions:

a) S->aS| AB| A| B, D-> b
b) S->aS| AB| A| B| a, D-> b
c) S->aS| AB| A| B
d) None of the mentioned

(xiii) Given grammar G: (1) S->AS (2) S->AAS (3) A->SA (4) A->aa Select the following productions denies the format of Chomsky Normal Form?

a) 2,4
b) 1,3
c) 1, 2, 3, 4
d) 2, 3, 4

(xiv) Justify , A PDA machine configuration (p, w, y) can be correctly represented as:

a) (current state, unprocessed input, stack content)
b) (unprocessed input, stack content, current state)

c) (current state, stack content, unprocessed input)
d) none of the mentioned

(xv) Two finite states are described as equivalent if

a) Both are final states
b) Both are non-final states
c) both have same number of states as well as transitions
d) Both a & b

Group-B
(Short Answer Type Questions) 3 x 5=15

2. State and prove the Arden's theorem. (3)

3. Consider the following CFG: E -->E+E |E*E |a. Show that the CFG with this production rule is ambiguous. (3)
4. Construct an equivalent FA for the given regular expression (0+1)*(00+11)(0+1)* (3)
5. (3)

Convert the following Moore machine to Mealy machine

Present State	Next Sate I/P=0	Next Sate I/P=1	Output
→ q_0	q_0	q_1	0
q_1	q_2	q_0	1
q_2	q_1	q_2	2

6. Convert the following grammar into CNF. (3)

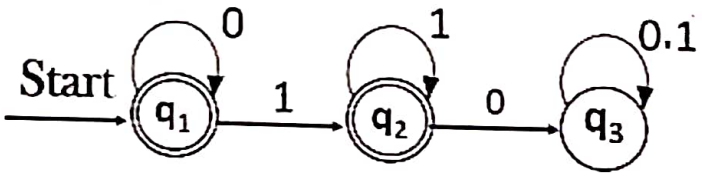
S→bA/aB A→bAA/aS/a B→aBB/bS/a.

OR

Construct a Moore Machine to implement the 2's Complement. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Quote the regular expression for the given DFA (5)



8. Using Pumping lemma prove that L = $\{0^n1^n | n \geq 1\}$ is not regular (5)

9. (5)

Convert the given Grammar to GNF:
S→CA|BB
B→b|SB
C→b
A→a

10. Find a reduced grammar equivalent to the grammar (5)
S→aAa
A→bBB
B→ab
C→aB

11. Construct equivalent PDA for the following CFG (5)
S→aA
A→aABC|bB|a
C→c
Show an ID for the string aabbbc for the PDA generated

12. (5)
Design a Turing machine that accepts the language of all strings which contains "aba" as a substring.

OR

Design a Turing machine that performs addition of two integers (5)

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