RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, FEBRUARY 2022

THIRD YEAR [BATCH 2019-22]

Date : 26/02/2022

COMPUTER SCIENCE (HONOURS)

Time : 11 am – 1 pm

PAPER : XI [CC11]

Full Marks : 50

Answer **any five** questions of the following: [5×10]

1. a) Construct a DFA for the language over {a , b} containing all the strings , where the leftmost symbol differs from the rightmost one.

   b) Design Moore machine to find the number of occurences of the substring 'ab' in a given string made with a , b . And verify it for the string 'bababa'. [4+(4+2)]

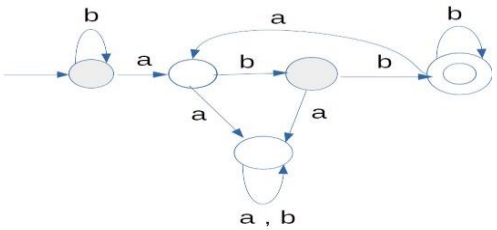
2. a) If two languages are regular, then prove that their union, intersection and complement of any one language is also regular.

   b) Construct a DFA equivalent to the NFA represented by the following transition table

	0	1
→p	{p,q}	{p}
q	{r,s}	{t}
r	{p,r}	{t}
*s	Φ	Φ
*t	Φ	Φ

   Also informally describe the language it accepts. [4+(4+2)]

3. a) Describe the Language recognized by the following machine.



   b) What do you mean by ambiguous grammar? Give an example.

c) Find the equivalent regular expression for the DFA given by following transition table.

	a	b
→p	q	r
*q	p	q
*r	q	p

Show the necessary steps. [2.5+2.5+5]

4. a) Explain briefly all the different type of languages classified by Chomsky.

b) Explain the difference between non deterministic pushdown automata and deterministic pushdown automata with example. [5+5]

5. a) Design the context free grammar for the language L = $\{a^n b^m c^k : k=|n-m|\}$

b) Design ϵ-NFA for the regular expression (0 + 10)*10* . Show the necessary steps. [5+5]

6. a) Define Chomsky normal form.

b) Convert the grammar with following productions to Chomsky normal form. Show the necessary steps.

S → aA | aBB
A → aaA | ϵ
B → bB | bbC
C → B

What language does this grammar generate? [2+(6+2)]

7. a) To check whether a given string is palindrome or not , design a Turing machine. Give the instantaneous descriptions for processing the string 'ababa' through your automaton.

b) If a language be L = {awa : w ϵ {a | b}*}, then what would be L^2 ?What do mean by Φ* ?
[(6+2)+(1+1)]

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