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CS-73

BACHELOR OF COMPUTER APPLICATIONS (BCA)

Term-End Examination

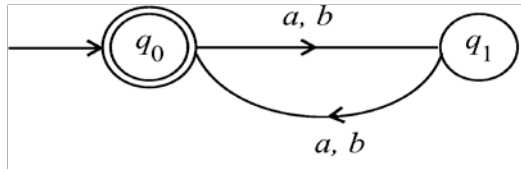
December, 2020

CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 Hours *Maximum Marks : 75*

Note : *Question* ***No. 1*** *is compulsory. Attempt any* ***three*** *questions from the rest.*

1. (a) Consider the DFA : 2



What does it accept ?

(b) Explain the application of regular expression in lexical analysis. 3

(c) Write the regular expression over alphabet set $\Sigma = \{a, b\}$ which contain ab as a substring. 3

(d) Define Context Free Grammar. Find the language accepted by the grammar : 5

$$S \rightarrow aS$$

$$S \rightarrow \leftarrow$$

(e) Prove that the class of regular language is closed under set difference. 5

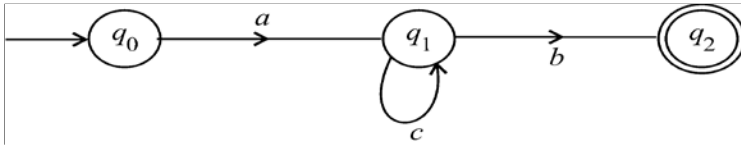
(f) What is the difference between DFA and NDFA ? 2

(g) Design the NFA for language : 5

$$L = (aa^* (a + b))$$

(h) Explain Non-deterministic TM with the help of an example. 5

2. (a) Find the regular expression for : 5



(b) Construct the $\in$ NFA for the regular expression : 5

$$(0 + 1)^* 1$$

(c) Write the CFG for the language : 5

$$L = a^n b^{m+n} c^n$$

$$m, n \geq 0$$

3. (a) Construct a PDA that accepts the following language : 5

$$L = \{a^3 b^n c^n \; n \geq 0\}$$

(b) Prove that : 5

$$L = \{a^n b^n c^n \; n \geq 1\}$$

is not a context free language.

(c) Design a TM that copies string of 1's more precisely. Find the MIC that perform the following computations : 5

$q_o w \vdash^* q_f\ ww$, for any $w \in \{1^+\}$.

4. (a) For two any recursive languages L_1 and L_2 show that $L_1 \cup L_2$ is also recursive. 5

(b) Show that the function is primitive recursive : 5

$$f(x, y) = x \quad \text{if } x = y$$
$$= 0 \quad \text{if } x \neq y$$

(c) Define NP head problems. Show that clique problem is NP complete problem. 5

5. (a) Prove that halting problem of TM is unsolvable. 5

(b) Define the following : 5

(i) Post Correspondence Problem

(ii) BNF Notation

(c) Find the dominant term having the steepest increases in n and specify the lowest Big-Oh complexity : 5

$$500n + 100\,n^{1.5} + 50\ n \log_{10} n$$