Question Paper

Exam Date & Time: 16-Nov-2018 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END - SEMESTER THEORY EXAMINATION- NOVEMBER 2018
III SEMESTER B.Sc.(Applied Sciences) in Engg.
FORMAL LANGUAGES AND AUTOMATA THEORY [CS 233]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

1) Give the properties of context -free languages by taking L1 and L2 as two context free languages. (5)

A)

B) Construct a deterministic finite automaton to accept strings of 0's and 1's ending with 00. (7)

C) Find regular grammar for the following languages on {a,b} consisting of all strings with no more than three a's. Show the steps to derive a string **"babbaab".** (8)

2) Prove that for any context free language L, there exists non deterministic pushdown automata (PDA) such that L=L (M). (10)

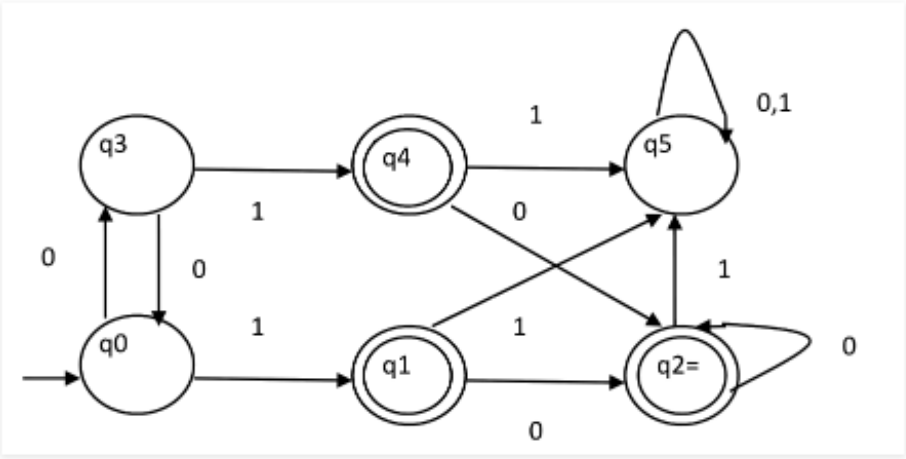
A)

B) Construct a Turing machine with input alphabet {a, b} to accept language $\{a_i b_j \mid i \geq 0, j \geq i\}$ by final state. (10)

3) Give an algorithm to minimize the number of states in DFA. (6)

A)

B) Minimize the number of states in a below given DFA. (10)



C) Obtain a regular expression such that L(R) ={w|w €{0,1}* } with at least three consecutive 1's. (4)

4) A) Write and explain the steps used to convert context free grammar(CFG) into Chomsky Normal Form(CNF). Using the same, convert the below given CFG to equivalent CNF
S → ASB , A → aAS|a|ϵ, B → SbS|A|bb (12)

B) When do you say that grammar a context free grammar? What are the types of derivation methods are used to derive some sentences from such a grammar? Explain each type of derivation with a suitable example. (8)

5) A) When do you say that two grammars are equivalent? Give two different the grammar to generate the same language L={$a^n b^n$: n>=0} and show by derivation that they are equivalent. (10)

B) Obtain an Non deterministic finite automata (NFA) to accept strings of a's and b's ending with ab or ba. Give the transition table for the NFA drawn by you and trace the input for **"aaaabbbbbbba"** and "**abababaa"**. (10)

6) A) What is a simple grammar? Explain with example. (5)

B) Construct a right linear grammar for the language L={ $a^n b^m$: n>=2,m>=3}. Use the grammar given by to derive the strings L^5,L^7 and L^8 . (9)

C) Draw a finite automata that accepts a language generated by the grammar:
S->aS1, S1->abS/b and generalize the grammar in the form of regular Language. (6)

7) A) When do you say the grammar is unrestricted grammar? Give an example for such a grammar? (4)

B) Draw a DFA to accepted decimal strings divisible by 5. (6)

C) Let X and Y are two positive integer numbers represented in unary. Obtain a Turing Machine to perform X+Y. (10)

8) A) Obtain the PDA to accept the language L(M)={wCw^R|w€ (g+a+d+g)*} where w^R is the reverse of w. Show the steps (12)

to trace the string "**gadagCgadag**".

B) Construct an NFA for a regular expression ab((a*+b*+c*))*c. (8)

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