(Please write your Exam Roll No.) *Exam Roll No.* 015

END TERM EXAMINATION

THIRD SEMESTER [MCA] DECEMBER 2015 - January 2016

Paper Code: MCA 201 **Subject: Theory of Computation**

Time : 3 Hours **Maximum Marks :60**

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each unit. Assume suitable data wherever necessary.

Q1. Answer the following questions: **(2x10=20)**

a) What are the different modules or phases of a Typical Compiler?

b) What is Right Most Derivation? How is it different from Leftmost Derivations?

c) What is Kleene's Theorem? Explain.

d) What is JFLAP? How is it useful in simulating various automata?

e) Explain the Church-Turing Thesis.

f) Convert the following Grammar into CNF notation.

$S \rightarrow AB$, $A \rightarrow a$, $B \rightarrow C \mid b$, $C \rightarrow c$

g) State post Correspondence Problem.

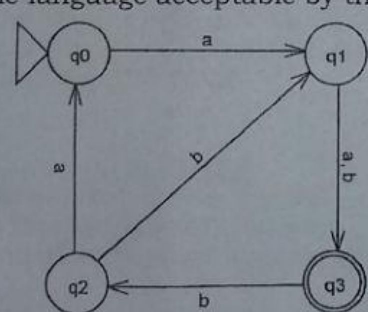
h) Write regular expression for the set of all strings not containing 101 as a substring over the alphabets {0, 1}. Provide justification that your expression is correct. $(0+1)^* \quad 0^* 1^* 0^*$

i) What is reducibility?

j) Define Universal Turing Machine.

Unit-I

Q2. a) Find the regular expression corresponding to the finite automation in fig. Also give the language acceptable by the automata. **(5)**



b) State and explain Pumping Lemma for Regular Grammar. **(5)**

Q3. a) Draw a DFA for Language defined on set of symbols {1, 2, 3} such that DFA accepts any string that begins with 1/3 and terminates with 2/3. **(5)**

b) State myhill Nerode Theorem and explain with suitable example application of the theorem. **(5)**

Unit-II

Q4. Given the following already augmented grammar: **(10)**

$S' \rightarrow S$

$S \rightarrow AB \mid AA \mid bC$

$A \rightarrow bCa \mid b$

$B \rightarrow Bd \mid \varepsilon$

$C \rightarrow c$

101

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

$(0+1)$

P.T.O.

MCA-201

P1/2

Draw the goto graph including just those states of an LR(1) parser that are pushed on the parse stack during a parse of the input bdd (this will be a subset of all configuration sets). If you accidentally construct irrelevant states, cross them out. Do not add or change any production in the grammar.

Q5. a) Draw/ Design Push Down Automata equivalent to the grammar and verify the result for the strings aaaabbaaaaa, aabaaa. **(6)**

$S \rightarrow aAA,\ A \rightarrow aS \mid bS \mid a$

b) What is GNF notation? How is grammar given in CNF notation converted in GNF notation? Explain with suitable example. **(4)**

Unit-III

Q6. a) Prove that Halting problem is undecidable. **(5)**

b) Design a Turing machine for adding two Positive Integers Numbers. **(5)**

Q7. a) State and Explain Recursion Theorem. **(5)**

b) Design a Turing Machine to test whether a given input on Σ={a, b} contains equal number of symbols a and b. **(5)**

Unit-IV

Q8. a) Define the classes P & NP. **(5)**

b) What do you understand by Probabilistic Computation? Explain. **(5)**

Q9. a) Define L, NL, & PSPACE complexity. **(5)**

b) State Savitch Theorem on Space Complexity and Prove it. **(5)**

****

aAA
aaSA
aaaSA
aaaaSA
bSSA

(0+1)* (11+

MCA-201
P2/2