Total No. of printed pages = 4

INT054102

Roll No. of candidate | | | | | | | | | | |

2017

End Semester M.Sc. (IT) Examination

1st Semester

THEORY OF COMPUTATIONS

Full Marks- 70 Time- 3 hours

The figures in the margin indicate full marks.

PART – A

Q.1. Answer all questions: 16 x 1 = 16

a) Define NFA and DFA.
b) What do you mean by string and language?
c) Write the regular expression for the language accepting the strings of all a's of any length.
d) Write the regular expression over alphabet ∑={a,b,c} containing atleast one 'a' and atleast one 'b'.
e) What is context free grammar?
f) What is ambiguity?
g) Give an example of leftmost derivation.
h) What is the difference between Push Down Automata and Turing Machine?
i) What is unit production and ε-production ?
j) Define Turing Machine.

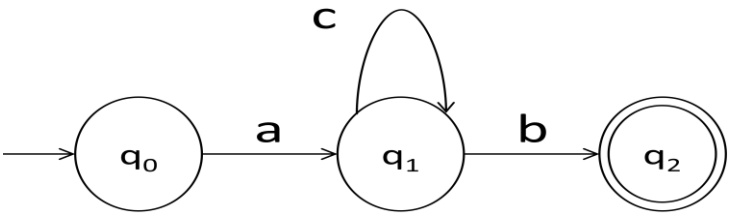
k) What is PDA?
l) What are the different types of Turing Machines?
m) State Church's hypothesis.
n)What is Chomsky Normal Form (CNF) ?
o) What is Rice's theorem?
p) Explain pumping lemma.

PART – B

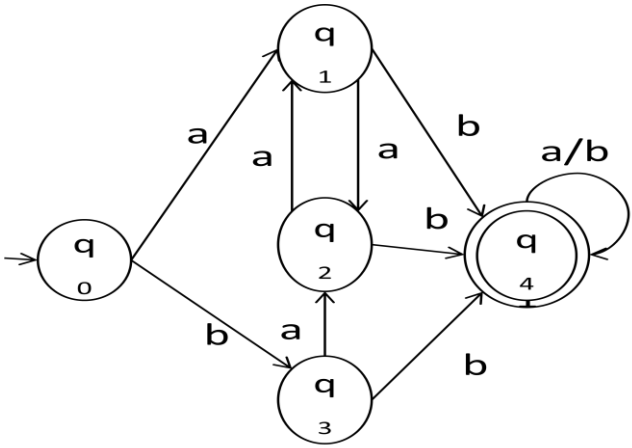
Q.2. Answer all questions: **4 x 3.5 = 14**

a) Design a DFA that accepts set of strings having exactly four 1's in every string over alphabet $\sum=\{0,1\}$.

b) Find the regular expression corresponding to the finite automaton given below (Use Arden's theorem):



c) Minimize the following DFA where q_0 is the initial state and q_4 is the final state:



d) Show that the following grammar is ambiguous:
$\mathbf{S \rightarrow a^2Sa \mid aSa \mid aS \mid \varepsilon}$

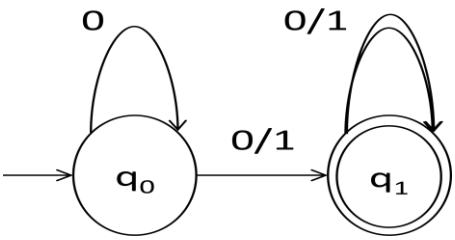
PART – C

Q.3.

Draw the **ε-NFA** for **(0+1)* 1 (0+1).** **10**

OR

Convert the given **NFA** into an equivalent **DFA**: **10**



Q.4.

Design a PDA for accepting the language { $L = a^n b^n \mid n >= 1$ }. Convert the following CFG into CNF: **10**

S → aaaaS
S→ aaaa

OR

Consider the following productions: **10**

S → aB | bA
A→ aS | bAA | a
B → bS | aBB | b

For the string **aaabbabbba** find:

a) The leftmost and rightmost derivation.
b) Parse tree.

Q.5.

Design a Turing Machine to accept the language **L =** $\{ 0^n 1^n \mid n > = 1\}$. **10**

OR

Construct the Turing Machine which recognizes the language **L = { wcw | w ∈ (a+b)*}**. **10**

Q.6.

Design Finite Automaton to check whether given decimal number is divisible by 3. **10**

OR

Prove that **L=** $\{ 0^n 1^n \mid n >= 1 \}$ is not regular. **10**