

Code: CS3T4

II B.Tech - I Semester – Regular Examinations – December 2015

**FORMAL LANGUAGES AND AUTOMATA THEORY
(COMPUTER SCIENCE AND ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1. a) Differentiate NFA and DFA.
- b) Write about finite automata with output.
- c) List any 8 identity rules.
- d) State pumping lemma of regular sets.
- e) Write down the steps in minimization of context free grammars?
- f) Show that grammar is ambiguous $S \rightarrow aSbS / bSaS / \epsilon$.
- g) Find a grammar in Chomsky normal form equivalent to $S \rightarrow aAbB, A \rightarrow aA/a, B \rightarrow bB/b$.
- h) Write about multi tape turing machine.
- i) Draw the model of Turing Machine.
- j) Write down the mathematical function of turing machine.
- k) Define NP hard and NP complete problems.

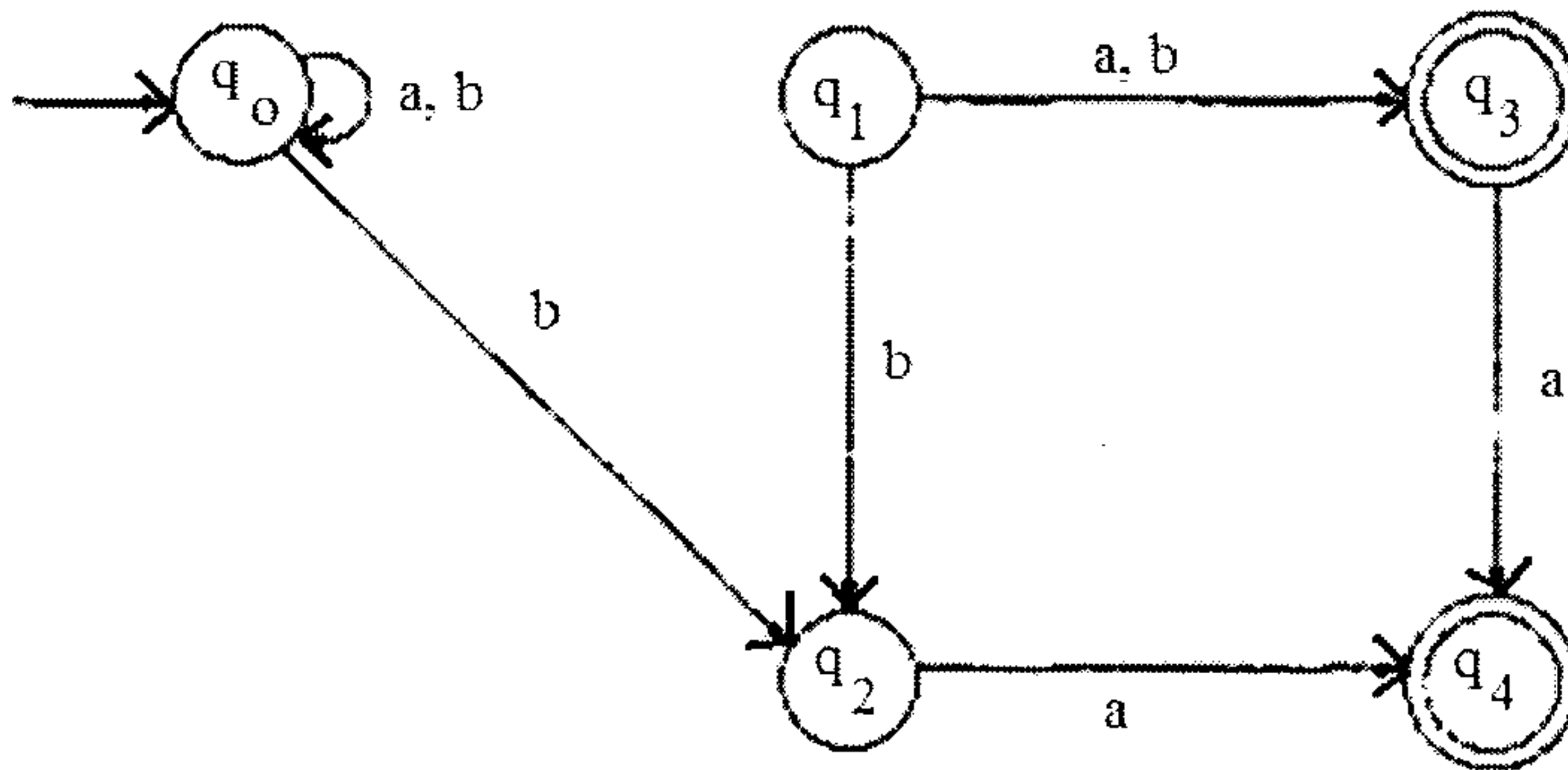
PART – B

Answer any **THREE** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) Construct NFA which accepts the set of all strings over $\{0, 1\}$ in which there are at least two occurrences of 1 between any two occurrences of 0. 8 M

b) Construct a Moore machine to determine the residue mod 3 for each binary string treated as a binary integer. 8 M

3. a) Derive the regular expression for the following finite automata. 8 M



b) Draw an NFA- ϵ that accepts $(00)^*1^*$ or $1^*(00)^*$ over $\{0, 1\}$. Translate the above NFA- ϵ to an equivalent NFA. 8 M

4. a) Construct a PDA for the language $L = \{a^n b^m c^{2n} \mid m, n \geq 1\}$. 7 M
- b) Reduce the following grammar to Greibach Normal Form. 9 M
 $S \rightarrow AB, A \rightarrow BSB, A \rightarrow BB, B \rightarrow aAb, B \rightarrow a, A \rightarrow b$
5. a) Design a Turing Machine for the language $L = \{SS \mid S \text{ is a string from an alphabet } \{a, b\}^*\}$. 10 M
- b) Explain in detail about counter machine. 6 M
6. Write short notes on
- a) Undecidability 5 M
- b) PCP 6 M
- c) Turing Reducibility 5 M