Reg. No.										

प्रज्ञानं ब्रह्म

Manipal
INSPIRED BY LIFE

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

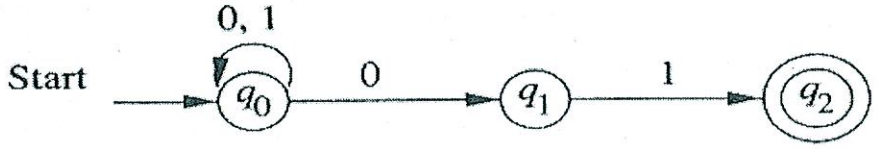
FIRST SEMESTER M. Tech(Software Engg.) DEGREE END SEMESTER EXAMINATION, DEC– 2015
SUBJECT: THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE(ICT 521)
(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **01/ 12 /2015** **MAX. MARKS: 50**

Instructions to candidates

- Answer any **FIVE FULL** questions.
- Missing data, if any, may be suitably assumed.

1A. Convert the following NFA to DFA.



1B. Give formal definition of a DFA. Find a DFA for accepting all strings over {a,b} such that there is no substring bbb.

1C. Construct an NFA for the following regular expression.

$(0+1)^*11+0^*$ [5+3+2]

2A. Give the proof for the theorem "If L=L(A) for some DFA A, then there is a regular expression R such that L=L(R)".

2B. Prove that the following language is not regular using Pumping lemma.
$L=\{a^nb^n: n>=1\}$

2C. List any four closure properties of regular languages and explain. [5+3+2]

3A. Design an NPDA for the following language.
$L= \{ ww^r : w \text{ is in } (a+b)^*\}$

3B. Convert following grammar to PDA.
$S \rightarrow AB \quad A \rightarrow aAb|ab \quad B \rightarrow cBd|cd$

3C. What are parse trees? Give an example for a parse tree. [5+3+2]

4A. Convert the following grammar to GNF.
$S \rightarrow AA|0 \quad A \rightarrow SS|1$

4B. Prove that "If L is CFL and R is regular language, then L∩R is a CFL".

4C. List any four undecidable problems about Context Free Language. [5+3+2]

5A. Design a Turing Machine to accept all strings with balanced parentheses.

5B. Discuss Storage in the state construction technique for Turing machines with a suitable example.

5C. Show that the class of Turing Machines with Semi-infinite tapes are equivalent to the standard Turing Machines. [5+3+2]

6A. List and give proof for any five closure properties of recursive languages.

6B. Prove that if there is a reduction from P1 to P2 then
i) If P1 is undecidable then so is P2
ii) If P1 is not recursively enumerable so is P2

6C. Give two examples for NP complete problems.

[5+3+2]