Reg. No. | | | | | | | | | | | | |

Question Paper Code : 27400

5 Year M.Sc. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Computer Technology

XCS 352 / 10677SW 505 – THEORY OF COMPUTATION

(Common to M.Sc. Software Engineering and M.Sc. Information Technology)

(Regulations 2003/2010)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define distinguishable and non-distinguishable states.

2. Is the regular language closed under union ? Prove it.

3. What is a parse tree ? Construct a parse tree for the string w = abb grammar $S \rightarrow AB$ $A \rightarrow Aa \mid a$ $B \rightarrow bB \mid b$.

4. Define Pushdown Automata.

5. Give the notations and initial configuration of a Turing machine.

6. Prove that if a language is recursive, then it is recursively enumerable.

7. What do you mean by an undecidable problem ?

8. Is it true, that complement of a recursive language is recursive ? Justify your answer.

9. State the Cook's theorem on NP-completener.

10. Define diagonal language.

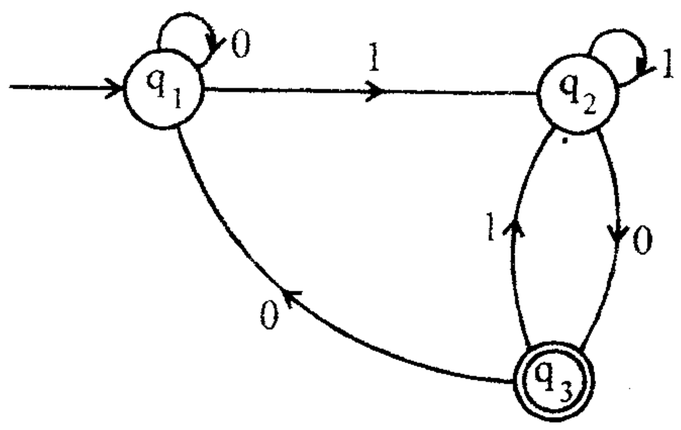
PART – B (5 × 16 = 80 Marks)

11. (a) (i) Construct a DFA to accept a set of all binary strings such that the 3rd symbol from right end is 1. **(8)**

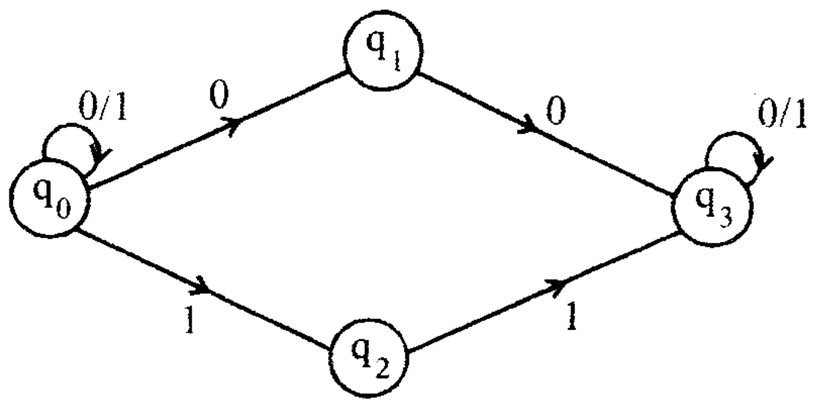
(ii) Prove that if L is accepted by an NFA with ∈-transitions, then L is also accepted by an NFA without ∈-transitions. **(8)**

OR

(b) (i) Construct a regular expression to the transition diagram. **(8)**



(ii) Construct an equivalent DFA for the following NFA given below. **(8)**



12. (a) (i) Obtain a CFG to generate a language of all non-palindrome over the alphabet Σ = {a, b}. Trace for a string of acceptance and non-acceptance using Leftmost derivation. **(8)**

(ii) Is S → aSbS | bSaS | ∈-ambiguous ? Justify and explain ambiguity. **(8)**

OR

(b) (i) Construct a PDA to accept L = $\{ww^R / w \in (0 + 1)^*\}$. **(8)**

(ii) For the grammar S → aABC

A → aB | a

B → bA | b

C → a

Obtain the corresponding PDA. Trace for the string w = aabaa. **(8)**

13. (a) Explain the various models of Turing machine with neat sketches wherever possible. What are the powers of each model ? **(16)**

OR

(b) (i) Design a Turing machine to accept the language L(a(a + b)*). **(8)**

(ii) Design a TM machine that copies strings of a's. Explaint the steps involved and show the sequences of moves for the input string aaa. **(8)**

14. (a) What are undecidable and unsolvable problems ? Discuss on unsolvable problems about grammars. **(16)**

OR

(b) (i) Prove that halting problem is undecidable. **(8)**

(ii) Explain the programmable Turing machine. How does enumeration help in the universal Turing machine ? **(8)**

15. (a) Explain PCP and MPCP problem and decide on their class. **(16)**

OR

(b) Explain the concept of NP-completeness and state one example problem and prove that it is NP – complete. **(16)**
