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

Question Paper Code : 75548

5 Year M.Sc. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth Semester

Information Technology

XCS 352/10677 SW 505 — THEORY OF COMPUTATION

(Common to 5 Year M.Sc. Computer Technology / M.Sc. Software Engineering)

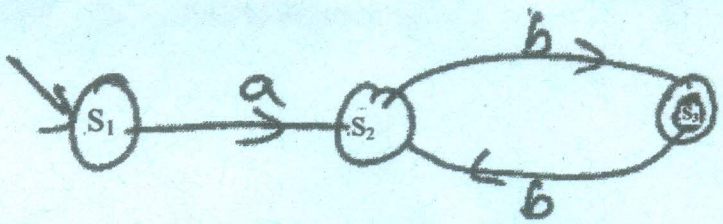
(Regulation 2003/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the language generated by



2. Construct a finite Automata for the regular expression $10 + (0 + 1)^*11$

3. Write the context free grammar for generating the set $\{a^i b^j c^k / i = j \text{ or } j = k\}$.

4. When a grammar said to be ambiguous?

5. Give an example for R.E language and a language which is not Recursively Enumerable.

6. Define a Random access Turing Machine.

7. Describe a machine which accepts a language L= $\{a^n b^n c^n / n \geq 1\}$.

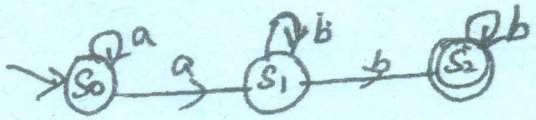
8. Define class–p problems and give an example.

9. What is post correspondence problem?

10. Find the complexity class of the language $L = \{a^n b^n c^n / n \geq 1\}$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Convert the following NFA to DFA. (8)



(ii) State and prove the pumping lemma. (8)

Or

(b) (i) Construct a finite automata to accept the strings end in '00' or end in '11' over the alphabets {0,1}. (8)

(ii) Show that $L = \{ww / w \in (a,b)^*$ is not regular. (8)

12. (a) (i) Write the context free Grammar for the Language $L = \{0^n1^n2^m3^m / n,m \geq 1\} \cup \{0^n1^m2^m3^n / n,m \geq 1\}$. (8)

(ii) Prove that the context free languages are closed under substitution and homomorphism. (8)

Or

(b) (i) Construct a pushdown Automata to the strings of equal number of $a's$ and $b's$. (8)

(ii) Given context free grammars G and G' with no ^ production that generates the language

$L(G) = \{^\wedge\}$

$S \rightarrow AB / ^\wedge$

$A \rightarrow aASb / a, B \rightarrow bs$. (8)

13. (a) (i) Describe the turing machine. Design a turing machine that can accept the Language $L = \{a^nb^{2n} / n > 0\}$. (8)

(ii) Explain how

(1) A computer can simulate turing machine

(2) A turing machine can simulate a computer. (8)

Or

(b) (i) Design a Turing Machine which can compute the square of a given unary number. (8)

(ii) Describe a Random access Turing machine with an example. (8)

14. (a) (i) Write the working rule of Universal Turing machine. (8)

(ii) Let G = $(\{A,B,C\},\{a,b,c\},P,S)$

With productions $S \rightarrow aABb / Bbb$

$Bb \rightarrow C$

$AC \rightarrow aac$

Construct a modified post correspondence problem– solution for "$w = aaac$". (8)

Or

(b) Write short note on any TWO

(i) Solvability, semi – solvability, unsolvability

(ii) Chruch – Turing thesis

(iii) Power of Universal Turing machine over FSM. (8)

15. (a) Write about class problems with examples Describe about sub Graph isomorphism problems and Boolean satisfiability problem. (16)

Or

(b) Describe about complexity of a problem. Write about space complexity and Time complexity of class NP problems. (16)
