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

Question Paper Code: 31524

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2016

Fifth Semester

Computer Science and Engineering

01UCS504 – THEORY OF COMPUTATION

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Define deductive proof.
2. Draw the transition diagram (automata) for an identifier.
3. Mention the closure properties of regular languages.
4. Give English description of the following language (0 + 10)*1*.
5. What are useless symbols in a grammar?
6. Construct PDA that accepts the language generated by the grammar

   $S \rightarrow 0BB$

   $B \rightarrow 0S|1S|0$
7. What is sentential forms?
8. When is checking off symbols used in TM?
9. Is travelling salesman problem a NP or P Problem? Justify.
10. What are recursive sets?

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Prove by Induction proof:

$1 + 4 + 7 + \cdots . + (3n - 2) = \frac{n(3n-1)}{2}$ for $n>0$. (8)

(ii) Consider following NFA with ε. Convert it to its equivalent DFA. (8)

State \ Input	a	b	c	ε
→ p	{p}	{q}	{r}	ϕ
q	{q}	{r}	ϕ	{p}
*r	{r}	ϕ	{p}	{q}

Or

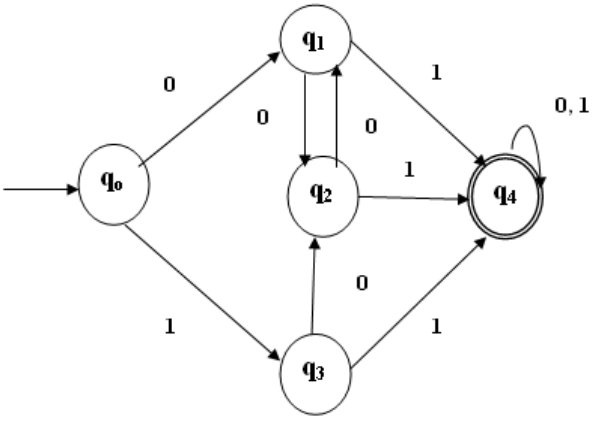
(b) (i) Let *L* be a set accepted by a NFA and then prove that there exists a DFA that accept *L*. (8)

(ii) Convert the following NFA to a DFA. (8)

State \ Input	x	y
→ a	{a}	{a, b}
b	{c}	{c}
* c	ϕ	ϕ

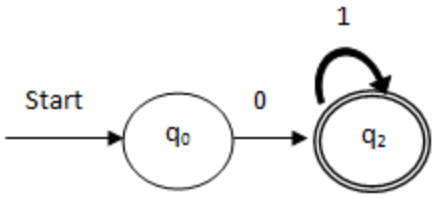
12. (a) (i) Explain the closure properties of regular language under Boolean operations. (6)

(ii) Explain the DFA minimization algorithm and minimize the finite automat on show in figure below and show both the given and reduced one are equivalent.



Or

(b) (i) Construct regular expression for the given automata using R_{ij} formula. (10)



(ii) Design a finite automaton for the regular expression $(0+1)^*(00+11)(0+1^*)$. (6)

13. (a) (i) Explain the types of grammar with examples. (6)

(ii) Construct a PDA to accept the language $L = \{a^n b^m c^n \mid n \geq 1\}$ by empty stack and by final state. (10)

Or

(b) (i) Explain about Parse trees. For the following grammar:

$S \rightarrow aB \mid bA$
$A \rightarrow a \mid aS \mid bAA$
$B \rightarrow b \mid bS \mid aBB$

For the string aaabbabbba. Find left most derivation, right most derivation and Parse tree. (6)

(ii) Let $M = (\{q_0,q_1\}, \{0,1\}, \{x,z_0\}, \delta, q_0, z_0, \phi)$ where δ is given by

$\delta(q_0,0,z_0) = \{(q_0,xz_0)\}$
$\delta(q_1,1,x) = \{(q_1,\in)\}$
$\delta(q_0,0,x) = \{(q_0,xx)\}$
$\delta(q_1,\in,x) = \{(q_1,\in)\}$
$\delta(q_0,1,x) = \{(q_1,\in)\}$
$\delta(q_1,\in,z_0) = \{(q_1,\in)\}$

Construct a CFG for the PDAM. (10)

14. (a) (i) Prove that $L1$ and $L2$ cannot be CFL by applying pumping Lemma. (6)

$L1 = \{a^m b^m c^m : m \geq 0\}$
$L2 = \{a^m b^k c^m d^k : m, k \geq 0\}$

(ii) Describe how TM is useful for computing arithmetic functions addition and proper subtraction? (10)

Or

(b) (i) Convert the following grammar into GNF. (6)

$S \rightarrow XY1 \mid 0$

$X \rightarrow 00X \mid Y$

$Y \rightarrow 1X1$

(ii) Design a Turing machine M to implement the function "multiplication" using the subroutine 'copy'. (10)

15. (a) (i) Prove that if a language is recursive if and only if it and its complement are both recursively enumerable. (8)

(ii) Prove that MPCP reduces to PCP with example. (8)

Or

(b) (i) State and prove post correspondence problem and Give the example. (8)

(ii) Define diagonalization language. Show that the language L_d is not a recursively enumerable language. (8)