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

Question Paper Code: 35204

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

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. Prove that "If *p* is a prime number bigger than 2, then *p* is odd".
2. Write RE which denotes the language L over the set $\Sigma = \{a,b\}$ such that all the strings do not contain the substring *ab*.
3. Define regular expression with example.
4. Write the RE to denote a language *L* over the input set *{a, b}* such that 3rd character from the right end of the string is always *a*.
5. Construct a CFG for the language $L=\{an, bn\}\ n>=1$.
6. Define Pushdown Automata.
7. Explain acceptance of PDA with empty stack.
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 $1^3+2^3+\ldots..+n^3 = \frac{n^2(n+1)^2}{4}$ by Mathematical Inductions. (8)

(ii) Design FA which checks whether the given unary number is divisible by 3. (4)

(iii) Design FA that accepts string that ends with abb. (4)

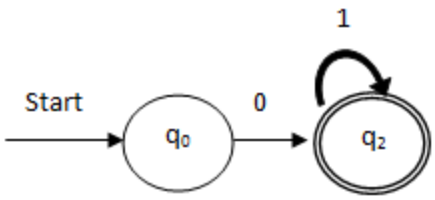
Or

(b) Show that a language L is accepted by some DFA if and only if L is accepted by some NFA. (16)

12. (a) Let *r* be a regular expression. Then prove that there exists a NFA with ϵ transition that accept *L(r)*. (16)

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) Construct a PDA accepting *{a n b m a n | m, n >= 1}* by empty stack. (16)

Or

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

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

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) Convert given CFG to GNF where $V=\{S,A\}$, $T=\{0,1\}$ and P is $S \rightarrow AA / 0$ $A \rightarrow SS / 1$. (16)

Or

(b) Explain how the multiple tracks in a Turing Machine can be used for testing given positive integer is a prime or not. (16)

15. (a) Show that for two recursive language L1 and L2 each of the following is recursive

(i) L1∩ L2 (ii) L1U L2 (iii) L1 ‘ (16)

Or

(b) Define Computational Complexity? Explain whether the class of Problems that can be solved in polynomial time is equivalent to the class of non-deterministic polynomial problems i.e whether P=NP. (16)

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