Total No. of Questions : 10]

SEAT No. :

P2412

[Total No. of Pages :3

[4758] - 580

T.E. (Computer)

THEORY OF COMPUTATION

(2012 Course) (End-Sem.) (310241)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer any five questions.*
2) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, wherever necessary.*

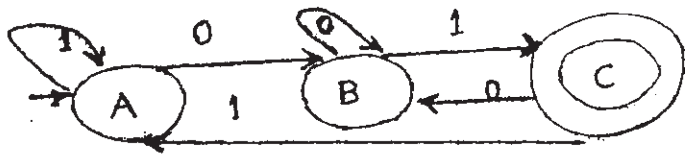
Q1) a) Explain Basic Machines. What are its limitations? How is Finite Automata more capable than Basic Machines? Justify with examples. **[6]**

b) Write a CFG that generates language L denoted by,

$(a+b)^*.bbb.\ (a+b)^*$. **[4]**

OR

Q2) a) Convert the following finite automation into its equivalent regular expression using Arden's Theorem. **[6]**



b) If S={a,bb}, find the set of all strings in S* with string length less than or equal to 5. Also for given S, prove whether the following is true or false. $(S^*)^+ = (S^+)^*$. **[4]**

Q3) a) Design Moore Machine and Mealy Machine to find one's complement of a binary number. **[6]**

P.T.O.

b) Write the CFG for language $L = \{0^i 1^j 0^k \mid j > i + k\}$.

Show the derivation of the string '0111100'. **[4]**

OR

Q4) a) Define the following and give appropriate examples: **[6]**

i) Unrestricted Grammar

ii) CFG

iii) Derivation Graph

b) Construct FA for the regular expression: (11)*.010. (11)*. **[4]**

Q5) a) Design a Turing Machine to recognize an arbitrary string divisible by 4, given $\Sigma = \{0,1,2\}$. **[10]**

b) Design a Turing Machine that accepts a language $L = \{0^n 1^n 0^n \mid n >= 1\}$. **[8]**

OR

Q6) a) Construct a TM that accepts a language L, a* ba*b. **[6]**

b) How can Turing Machines be compared to computers? **[6]**

c) Prove that the halting problem in Turing Machines is undecidable. **[6]**

Q7) a) Construct transition table for PDA that accepts the language $L = \{a^{2n} b^n \mid n >= 1\}$. Trace your PDA for the input with n = 3. **[10]**

b) Define push down automata (PDA). What are the different types of PDA? Give the applications of PDA. **[6]**

OR

Q8) a) Give a grammar for the language L(M), where: **[8]**
$M = (\{q_0, q_1\}, \{0,1\}, \{z_o, x\}, \delta, q_0, z_0, \Phi)$.

And δ is given by:

$\delta(q_0, 1, z_o) = (q_0, xz_o)$ $\delta(q_0, \varepsilon, z_o) = (q_0, \varepsilon)$

$\delta(q_0, 1, x) = (q_0, xx)$ $\delta(q_1, 1, x) = (q_1, \varepsilon)$

$\delta(q_0, 0, x) = (q_1, x)$ $\delta(q_0, 0, z_o) = (q_0, z_o)$

b) Construct PDA for the following regular grammar: **[8]**

S - > 0A | 1B |0

A - > A 0 | B

B - > c| d

Q9) a) Justify that the SAT Problem is NP-complete. **[8]**

b) Explain in detail, the polynomial -time reduction approach for proving that a problem is NP- Complete. **[8]**

OR

Q10) a) Explain the Node-Cover Problem with a suitable example. **[8]**

b) Explain Tractable and In-tractable Problem. **[4]**

c) Justify whether the Traveling Salesman Problem is a class P or class NP problem. **[4]**

☼ ☼ ☼