

Total No. of Questions : 10]

SEAT No. :

P2412

[4758] - 580

[Total No. of Pages :3

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.

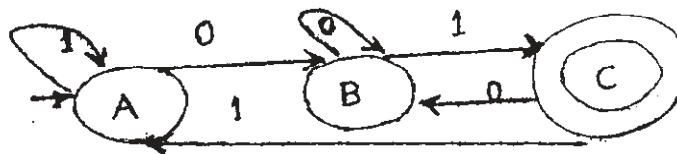
Q1) a) Explain Basic Machines. What are its limitations? How is Finite Automata more capable than Basic Machines? Justify with examples. [6]

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 $L = \{0^n 1^n 0^n \mid n \geq 1\}$. [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 $L = \{a^{2n} b^n \mid n \geq 1\}$. 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]

$M = (\{q_0, q_1\}, \{0,1\}, \{z_0,x\}, \delta, q_0, z_0, \Phi)$.

And δ is given by:

$$\delta(q_0, l, z_o) = (q_0, xz_o) \quad \delta(q_0, \epsilon, z_o) = (q_0, \epsilon)$$

$$\delta(q_0, l, x) = (q_0, xx) \quad \delta(q_1, l, x) = (q_1, \epsilon)$$

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

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

$$S \rightarrow 0A \mid 1B \mid 0$$

$$A \rightarrow A0 \mid B$$

$$B \rightarrow c \mid d$$

- 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]

