

Total No. of Questions :10]

SEAT No. :

P2616

[Total No. of Pages :3

[5153] - 592

T.E. (I.T.)

THEORY OF COMPUTATION

(2012 Pattern) (Semester - I) (End-Semester) (314442)

Time : 2½Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Construct FA that accepts even number of zeros & odd number of ones. **[6]**

b) Write formal definition of regular expression with suitable example. State Arden's theorem and its use. **[4]**

OR

Q2) a) Construct a Moore machine to find out the residue-modulo-3 for binary number. **[6]**

b) Define regular sets. List out closure properties of regular sets. **[4]**

Q3) a) Define the following and give appropriate examples **[4]**

i) Derivation tree

ii) Context free grammar

b) Convert right linear grammar to its equivalent left linear grammar. **[6]**

$S \rightarrow bB$

$B \rightarrow bC$

$B \rightarrow aB$

$B \rightarrow b$

$C \rightarrow a$

OR

P.T.O.

- Q4) a)** Construct a DFA equivalent to the following grammar [6]
 $S \rightarrow S10|0$
- b) Write a short note on the applications of CFG. [4]
- Q5) a)** Design a PDA that checks wellformedness of parentheses. Simulate PDA for $((() (()))$. [8]
- b) Define and compare DPDA and NPDA. Justify that NPDA is more powerful than DPDA. [8]

OR

- Q6) a)** Construct a PDA for the language generated by the following grammar [8]
 $S \rightarrow aB | bA$
 $A \rightarrow bAA | a | aS$
 $B \rightarrow b | bS | aBB$
- b) Define post machine. Compare FA, PDA and post machines. [8]
- Q7) a)** Write a short note on: [8]
- i) Church Turing Hypothesis
- ii) Post correspondence problem
- b) Design a Turing Machine to recognize the language $L = \{1^n 2^n 3^n | n \geq 1\}$. Simulate TM for "112233". [10]

OR

- Q8) a)** Design a Turing machine that accepts $L = \{0^n 1^n | n \leq 1\}$. Simulate TM for "000111". [10]
- b) Explain the following for a TM [8]
- i) Power of TM over finite state machine
- ii) Universal TM

- Q9) a)** Write a short note on decidable problems concerning **[8]**
- i) Context free languages
 - ii) Turing machines
- b) What is reducibility? What are undecidable problems? Describe at least four undecidable problems in case of CFGs. **[8]**

OR

- Q10)a)** Describe post correspondence problem. PCP is an unsolvable problem. Justify. **[8]**
- b) What are recursive and recursively enumerable languages? What is the relation between them? **[8]**

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