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→bB

B→bC

B→aB

B→b

C→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]**

$S \rightarrow aB \mid bA$

$A \rightarrow bAA \mid a \mid aS$

$B \rightarrow b \mid bS \mid aBB$

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 correpondence problem

b) Design a Turing Machine to recognize the language $L = \{1^n2^n3^n \mid n>=1\}$. Simulate TM for "112233". **[10]**

OR

Q8) a) Design a Turing machine that accepts $L = \{0^n1^n \mid n<=1\}$. 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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