Total No. of Questions : 10]

SEAT No. :

P2469

[Total No. of Pages : 3

[5253]-192

T.E. (I.T.)

THEORY OF COMPUTATION

(2012 Pattern) (End Semester)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

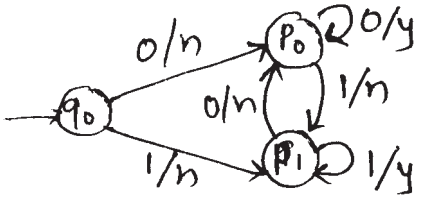
1) ***Neat diagram must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Define the following with suitable examples **[4]**

i) FA

ii) Regular Expression

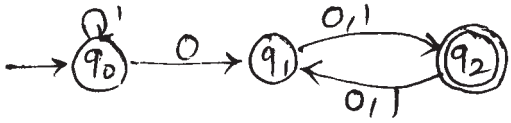
b) Convert Mealy machine to Moore machine. **[6]**



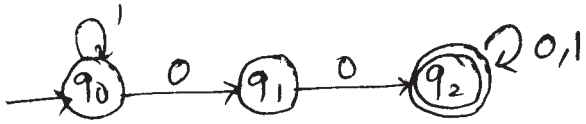
OR

Q2) a) Find the regular expression for the following : **[4]**

i)



ii)



b) Prove that the following language is non regular, using pumping lemma. **[6]**

$L = \{a^n b^n \mid n>0\}$

P.T.O.

Q3) a) Write a CFG which generates the language L denoted by **[6]**

i) (a+b)*bbb(a+b)*

ii) $\{0^m\ 1^n\ 0^{m+n} | m,n \geq 0\}$

b) Write short note on chomsky hierarchy. **[4]**

OR

Q4) a) Convert the following grammar into GNF **[4]**

$S \rightarrow ABA\,|AB\,|BA\,|AA\,|\,A\,|B$

$A \rightarrow aA\,|a$

$B \rightarrow bB\,|b$

b) Define the following with suitable example. **[6]**

i) Chomsky normal form

ii) Leftmost derivation

iii) Regular grammar

Q5) a) Design a post machine that accepts the following language. **[8]**
$L=\{a^n b^n a^n | n \geq 0\}$

b) Explain the following using suitable examples. **[8]**

i) Acceptance of a CFL by empty stack by a PDA.

ii) Acceptance of a CFL by final state by a PDA.

OR

Q6) a) Construct a PDA for the language described as "The set of all strings over $\Sigma = \{a, b\}$ with equal no. of a's and b's. **[8]**

b) Give formal definitions of PDA and PM. Compare them. **[8]**

Q7) a) Design a TM that adds two unary numbers. Show stepwise functioning of TM for the input: 11 + 111 **[10]**

b) Write a short note on : **[8]**

i) Power of TM over finite state machine.

ii) Universal turing machine

OR

Q8) a) Construct TM for the following : **[10]**

i) Language consisting of string having any number of 0's & even no. of 1's over $\Sigma = \{0,1\}$.

ii) Increment the value of any binary number by one.

b) Define TM. Explain its working. Give the types of TM & applications of the same. **[8]**

Q9) a) What is reducibility? What are undecidable problems? Describe at least four undecidable problems in case of TMs. **[8]**

b) Write a short note on encoding of TM. **[8]**

OR

Q10)a) Write a short note on church Turing hypothesis. **[4]**

b) Describe at least four undecidable problems in case of CFGs. **[4]**

c) Define recursively enumerable languages and recursive languages with suitable example. **[8]**