Total No. of Questions : 10]

SEAT No. :

P2910

[Total No. of Pages : 3

[4958]-1105
T.E. (I T)
THEORY OF COMPUTATION
(2012 Pattern) (End Semester) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions:

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

Q1) a) Define the following terms **[4]**

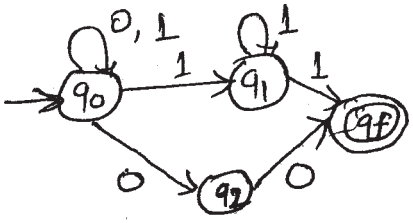
i) Strings

ii) Language

iii) Alphabets

iv) Kleen closure

b) Obtain a DFA equivalent to the NFA. **[6]**



OR

Q2) a) Explain the Basic Finite Automata? What are the various application & limitation of it? **[4]**

b) Describe in the simple english the language defined by the following RE

i) $(a+b)^* a (a+b)^*$

ii) $(01^*0)^* 1$

iii) $a(a+b)^* bb$ **[6]**

P.T.O.

Q3) a) Obtain regular expression to the following regular grammar **[4]**

$S \rightarrow aA/bB$

$A \rightarrow bA/a$

$B \rightarrow aB/b$

b) Simplify given grammar **[6]**

$S \rightarrow AaA$

$A \rightarrow Sb/bcc/\in$

$C \rightarrow cc/abb$

OR

Q4) a) Define ambiguous Grammar. Show given Grammar is ambiguous or not.
$S \rightarrow aSbS/bSaS/\in$ **[4]**

b) Construct a FA for given regular expression $(10)^* 101(01)^*$ **[4]**

c) Define derivation tree with suitable example. **[2]**

Q5) a) Give formal Definition of Push Down automata & applications of PDA. **[4]**

b) Construct a PDA accepting $L = \{w \subset w^R \mid w \text{ is in } (a/b)^* \text{ and } w^R \text{ is reverse of } w\}$ **[8]**

c) Prove that the Language $L = \{ww \mid w \text{ is in } (0+1)^*\}$ is not a CFL. **[6]**

OR

Q6) a) Give the CFG generating the Language accepted by the following PDA. **[8]**

M = $(\{q_0,q_1\}, \{0,1\}, \{z_0,x\}, \delta, q_0,z_0,\phi\}$ where δ is given below

$\delta\ (q_0,1,z_0) = \{(q_0,xz_0)\}$

$\delta\ (q_0,1,x) = \{(q_0, xx)\}$

$\delta\ (q_0,0,x) = \{(q_1, x)\}$

$\delta\ (q_0,\in,z_0) = \{(q_0, \in)\}$

$\delta\ (q_1,1,x) = \{(q_1, \in)\}$

$\delta\ (q_1,0,z_0) = \{(q_0, z_0)\}$

b) Write short note on post machine with example. **[6]**

c) Construct a PDA equivalent to following grammar **[4]**

$S \rightarrow aAA$

$A \rightarrow aS / bS / a$

Q7) a) Construct a Turing machine to perform mod2 operation on given binary number retain original number as well as store result after number separated by blank. **[8]**

b) Differentiate between FA, PDA, and TM. **[4]**

c) Write short note on multitape turing machine. **[4]**

OR

Q8) a) Construct a Turing machine to perform the two's complement of given binary number. **[8]**

b) Write short note on universal Turing machine. **[8]**

Q9) a) Write short note on post correspondence problem (PCP). **[4]**

b) Explain with example decidable & non decidable language. **[6]**

c) Explain with example Turing Reduceability. **[6]**

OR

Q10)a) Show that following decision problems are recursive. **[10]**

i) NFA accepts a word or not

ii) CEG G generates the string w or not.

b) Write short note on recursive language & recursively enumerable language with suitable example. **[6]**