Total No. of Questions : 10]

SEAT No. : ____

P1761

[Total No. of Pages : 3

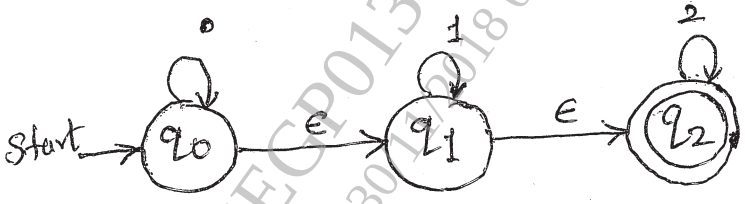
[5460] - 591
T.E. (IT)
THEORY OF COMPUTATION
(2015 Pattern)

Time : 2½ Hours] ***[Max. Marks :70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary***
3) ***Figures to the right, indicate full marks***
4) ***Assume suitable data, if necessary***

Q1) a) Convert the NFA with ∈ moves, for the following Transition Diagram, into its equivalent DFA. **[8]**



b) State properties & limitations of FSM. **[2]**

OR

Q2) a) Find the regular expression for the language **[6]**

i) Consisting of all strings of a's & b's without any combination of double letters.

ii) over Σ = {a, b} containing at least one 'a' & at least one 'b'.

iii) Consisting of set of all strings that start with 'a' and do not have two consecutive 'b's.

b) Construct Transition Graph for the following regular expression. **[4]**

r = 1*·0·0· (0 + 1)*

P.T.O.

Q3) a) Write a context free language (CFL) for the following CFG. **[6]**

i) $S \rightarrow OSO \mid A \mid \in$

$A \rightarrow 1SO \mid \in$

ii) $S \rightarrow a\ Sc \mid A \mid \in$

$A \rightarrow aAb \mid \in$

b) Eliminate $\in$ - productions from the given Grammar consisting of following productions **[4]**

$S \rightarrow a\ S\ a \mid b\ S\ b \mid \in$

OR

Q4) a) Convert the following grammar G to GNF **[8]**

$G = \{(A_1\ A_2\ A_3), (a, b), P, A_1\}$

Where P consists of the following productions :

$A_1 \rightarrow A_2\ A_3$

$A_2 \rightarrow A_3\ A_1 \mid b$

$A_3 \rightarrow A_1\ A_2 \mid a$

b) State applications of Context - free Grammar. **[2]**

Q5) a) Define PDA. Construct PDA that accepts the following language. **[8]**

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

Simulate for ω = aaabb

b) Construct a PDA that accepts the following language. **[8]**

$L = \{X, aXa, bXb, aaXaa, abXba.....\}$

OR

Q6) a) Construct PM that multiplies two unary numbers write simulation for **[10]**

i) aa.a

ii) aaa.aaa

b) Give difference between PDA & PM. **[6]**

Q7) a) Design a TM that recognizes strings containing equal no. of 0's & 1's Write simulation for any two input strings. **[9]**

b) Design a TM that recognizes binary palindromes. Write simulation for any two input strings. **[9]**

OR

Q8) a) Design TM that finds the Greatest Common Divisor (GCD) of two given numbers. Find GCD of 4 & 2. **[12]**

b) Write short note on types of TM. **[6]**

Q9) a) Prove that.

PCP = {<p> |p is an instance of the Post Correspondence problem with a match}. **[10]**

b) Write short note on p - class with examples. **[6]**

OR

Q10) a) Prove that following are decidable languages. **[10]**

i) A_{NFA} = {<B, ω> | B is an NFA that accepts input string ω}

ii) A_{REX} = {<R,ω> | R is a regular expression that generates string ω}

b) Explain computational complexity with example. **[6]**

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