

Total No. of Questions :10]

SEAT No. :

P3625

[5560]-581

[Total No. of Pages :3

T. E. (Information Technology)
THEORY OF COMPUTATION
(2015 Pattern) (Semester-I)

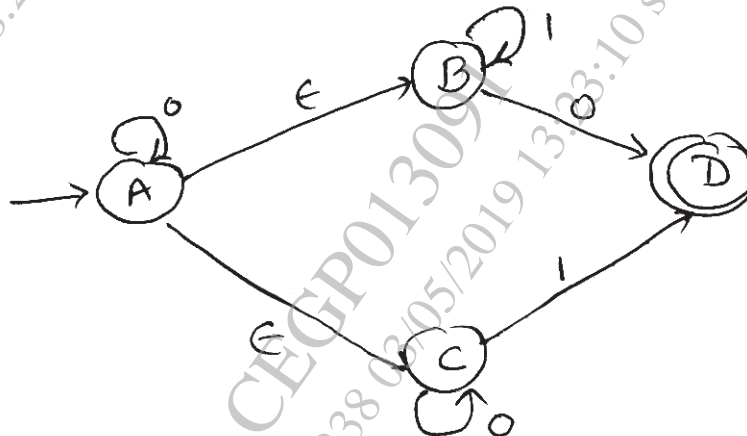
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Convert the following NFA with ϵ -moves into NFA without ϵ moves. [6]



b) Give formal definitions for the following [4]

- i) Deterministic finite automata
- ii) Moore machine
- iii) Reachable states of P
- iv) Acceptance of a string by FA

OR

Q2) a) Construct FA for the following language L. [8]

$L = \{w/w \text{ is a binary word of length } 4i, i \geq 1 \text{ such that each consecutive block 4 bits contains at least 2 0's}\}$

b) Give difference between moore & mealy machine. [2]

P.T.O.

Q3) a) Show that. [6]

i) $(a.b)^* \neq a^*.b^*$

ii) $(a + b)^* = (a + b)^* + (a + b)^*$

b) Convert the following grammar to GNF [4]

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

$$A \rightarrow aA / a$$

$$B \rightarrow bB / b$$

OR

Q4) a) Write CFG for the following languages. [6]

$$L = \{0^i 1^j 0^k \mid j > i + k\}$$

$$L = \{0^i 1^j 2^k \mid i = j + k\}$$

b) Convert the following grammar to CNF. [4]

$$S \rightarrow bA | aB$$

$$A \rightarrow bAA | as | a$$

$$B \rightarrow aBB | bs | b$$

Q5) a) Construct PDA that accepts the language by the following CFG. [8]

$$S \rightarrow SS | (S) | ()$$

b) Construct post Machine that accepts the following language. [8]

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

OR

Q6) a) Show that: $L = \{a^n b^n c^n \mid n \geq 1\}$ not a CFL. [5]

b) Construct post machine that accepts following language [5]

$$L = \{a^n b^m \mid n \geq 0, m \geq 0\}$$

c) Construct PDA that accepts following language $L = \{a^n b^n \mid n \geq 0\}$. [6]

Write simulation for string 'aaabbb'

Q7) a) Construct a TM to compute $L = \{a^n b^{2n} \mid n > 0\}$ Write simulation for the string.

i) abb ii) aabbbb [10]

b) Design TM for the language $L = \{0^{2n}\}$ over $\Sigma = \{0,1\}$. [8]

OR

Q8) a) Design a TM that multiplies two unary numbers over $\Sigma = \{1\}$. Write simulation for the string 11&111. [8]

b) Design TM to accept the set L of all strings formed with 0&1 and having substring '000'. [8]

c) Differentiate between FA & TM. [2]

Q9) a) Prove that [8]

i) AREX = $\{\langle R, W \rangle \mid R \text{ is a regular expression that generates string } w\}$ is a decidable language.

ii) ECFG = $\{\langle G \rangle \mid G \text{ is a CFG and } L(G) = \emptyset\}$ is a decidable language.

b) Explain class P with two examples. [8]

OR

Q10) a) Prove that $ATM = \{\langle m, w \rangle \mid M \text{ is a TM and accepts } w\}$ is undecidable [8]

b) Explain post correspondence problem. [8]

