

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)**

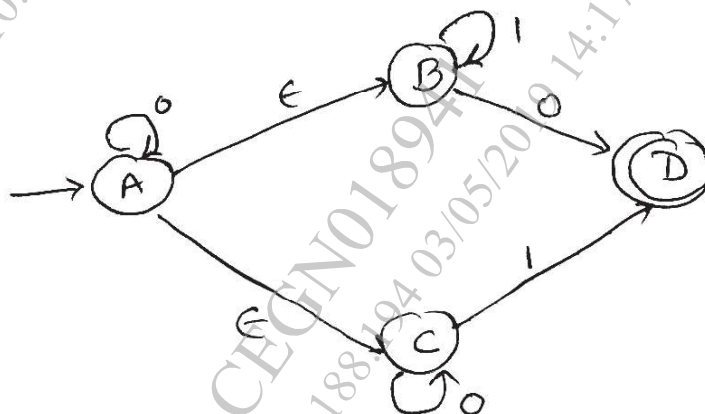
Time : 2½ Hours]

[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  $\epsilon$ -moves into NFA without  $\epsilon$  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)  $(ab)^* \neq a^* \cdot b^*$

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

**b)** Convert the following grammar to GNF [4]

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

$$A \rightarrow aA \mid a$$

$$B \rightarrow bB \mid b$$

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]

$$S \rightarrow bA \mid aB$$

$$A \rightarrow bAA \mid as \mid a$$

$$B \rightarrow aBB \mid bs \mid b$$

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

$$S \rightarrow SS \mid (S) \mid ()$$

**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]

