Total No. of Questions : 8] **SEAT No. :**

PB-3858

[Total No. of Pages : 2

[6262]-121
T.E.(Information Technology Engineering)
Theory of Computation
(2019 Pattern) (Semester-I) (314441)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is an ambiguous grammar? Explain with a suitable example. **[4]**

b) What is Regular Grammar? Explain types of regular grammar. **[5]**

c) Convert the following grammar to GNF. **[9]**

$S \rightarrow AB$

$A \rightarrow BSB \mid BB \mid b$

$B \rightarrow aAb \mid a$

OR

Q2) a) Write CFG for the language $L = \{ a^i b^j c^k \mid i = j + k \ \& \ j, k >= 1 \}$ **[6]**

b) Convert the following RLG to FA. **[6]**

$S \rightarrow 0A \mid 1B \mid 0 \mid 1$

$A \rightarrow 0S \mid 1B \mid 1$

$B \rightarrow 0A \mid 1S$

c) Explain any three closure properties of Context Free language. **[6]**

Q3) a) Define Push down Automata. Explain different types of PDA. Explain. any two applications of PDA. **[6]**

b) Write a note on Instantaneous Description of PDA with an example **[5]**

P.T.O.

c) Convert the following CFG to PDA that accepts the same language by empty stack. **[6]**

$S \rightarrow 0S1 \mid A$

$A \rightarrow 1A0 \mid S \mid \varepsilon$

OR

Q4) a) Compare Finite Automata and Pushdown Automata. **[4]**

b) Design a Pushdown Automata for the following language. **[7]**

$L=\{0^a1^b2^c \mid a+c=b\}$

c) Design Post Machine for $L = \{0^n1^n \mid n \geq 0\}$ **[6]**

Q5) a) Write a note on Universal turing Machine **[6]**

b) Explain Church Turing hypothesis. **[3]**

c) Define Turing machine and design a right shifting TM over alphabet {0,1} with an example. **[9]**

OR

Q6) a) Construct a Turing Machine to replace string '110' by '101' in a binary input string. Write down transition table along with diagram. **[10]**

b) Discuss the following terms **[8]**

i) Post Correspondence Problem

ii) Halting Problem of Turing Machine

Q7) a) What do you mean by NP problems? Justify why the Travelling Salesman problem is a NP problem. **[8]**

b) Define decidability of problem with suitable example. Describe un- decidable problems for context-free Grammar. **[9]**

OR

Q8) a) Write short note on : **[9]**

i) A Simple Un-decidable problem

ii) Measuring Complexity

b) Explain in detail Cook's theorem. **[8]**