Total No. of Questions : 8]

SEAT No. : ____

PD4242

[Total No. of Pages : 2

[6403]-36

T.E. (Computer Engineering)
THEORY OF COMPUTATION
(2019 Pattern) (Semester - V) (310242)

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

Q1) a) Give Context Free Grammars for the following languages and show the derivation for given string. **[12]**

i) L={ w ∈ {a,b}*|w is string of staring with 'a' and ending with' b' } show the derivation for "ababab"

ii) $L = a^n b^{2n}$ where n>=1. Show the derivation for "aabbbb"

iii) RE= (0+1)* Show the derivation for "0110"

b) Reduce the following grammar to Greibach Normal form. **[6]**

S –> AA | 0

A –> SS | 1

OR

Q2) a) Convert the following grammar to CNF. **[8]**

$S \rightarrow aSa \mid bSb \mid A \mid \varepsilon$

$A \rightarrow a \mid b \mid \varepsilon$

b) In the grammar, convert the given production rule into GNF form. If any production rule in the grammar is not in GNF form, convert it. **[10]**

$S \rightarrow XB \mid AA$

$A \rightarrow a \mid SA$

$B \rightarrow b$

$X \rightarrow a$

Q3) a) i) Construct PDA for the given CFG, and test whether 010^4 is acceptable by this PDA. **[10]**

$S \rightarrow 0BB$

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

ii) Construct PDA for the given CFG, and test whether 'aaabb' is acceptable by this PDA.

$S \rightarrow aSb$

$S \rightarrow a \mid b \mid \varepsilon$

b) Construct PDA to accept L= { $a^n b^n$ | n>= 1 } through empty stack. **[4]**

c) Convert the given PDA to CFG S->0S1 | 00 | 11 **[4]**

OR

P.T.O.

Q4) a) Construct Pushdown automata for $L = \{0^n1^m2^{(n+m)} | m,n \geq 0\}$ **[6]**

b) NPDA for accepting the language $L = \{a^{2m}b^{3m} | m \geq 1\}$ **[6]**

c) NPDA for accepting the language $L = \{a^ib^jc^kd^1 | i==k \text{ or } j==1,i>=1,j>=1\}$ **[6]**

Q5) a) Write short notes on with suitable diagrams. **[12]**

i) Reducibility

ii) Multi-tape Turing Machine

iii) Multi-head Turing Machine

iv) Two-way infinite Tape Turing Machine:

v) Multi-tape Multi-head Turing Machine

b) Construct a TM for subtraction of two unary numbers f(a-b) = c where a is always greater than b. Explain the logic of building this Turing machine. **[5]**

OR

Q6) a) Draw a Turing Machine to increment a binary number by 1 and demonstrate with any example. **[6]**

b) Obtain a Turing Machine to accept the language containing strings of a's and b's that do not end with abb. **[7]**

c) Construct a TM for the language $L = \{0^n1^n2^n\}$ where n≥l **[4]**

Q7) a) What Minimum spanning tree problem? Prove that finding MST by using Kruskal's algorithm is in class P. **[5]**

b) What is post correspondence problem? Why is post correspondence problem undecidable? Explain PCP with following instance of the set of the strings A and B. **[12]**

	A	B
1.	1	111
2.	10111	10
3.	10	0

OR

Q8) a) Define and Compare Class P and Class NP Problem with suitable diagram. **[8]**

b) State and explain with suitable example. **[9]**

i) Decidable Problem

ii) Undecidable Problem

iii) Church-Turing Thesis

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