2022

COMPUTER SCIENCE

[HONOURS]

(CBCS)

(B.Sc. Fifth Semester End Examination-2022)

PAPER-CC12T

[Theory of Computation]

Full Marks: 40 ***Time: 02 Hrs***

The figures in the right hand margin indicate marks
Candidates are required to give their answers in their own words as far as practicable
Illustrate the answers wherever necessary

Group-A

1. Answer any five questions of the following: **5x2=10**

a) What do you mean by context sensitive grammar?

b) Construct the grammar for the language $a^n b^m, n \geq 3, m \geq 2$.

c) Show that $\left(P^*(QP^*)^*\right) = \left(P^*Q\right)^* P^*$.

d) give the difference between DFA and NFA.

e) What is the advantage of Turing machine?

f) Design NFA that accepts a set of all strings ending in 00.

g) State pumping Lemma for context free language.

h) Obtain the CFG to generate the regular expression $(011+1)^*(01)^*$.

i) What do you mean by undecidable of a language?

j) What is Chomsky normal form?

k) What is the advantage of PDA?

l) What is Mealy machine?

m) State any two properties of CFL'S.

Group-B

Answer any four questions of the following: **4x5 = 20**

2. Consider a grammar $S \to a / \wedge / (T)$, $T \to T, S / S$

   Find left most derivation of the string $(((a,a),\wedge,(a)),a)$

3. Let $L(G) = \{a^n b^m / (n+m)$ is odd$\}$

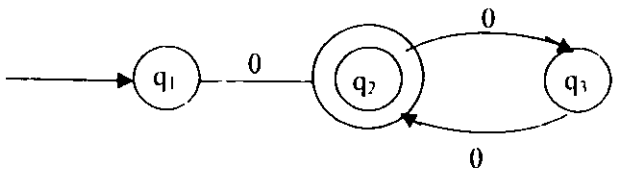
   Find the grammar.

4. To design a DFA that

   i) Starts with 0 and has odd number of 0's.

   ii) Starts with 1 and has even number of 1's.

5. Construct RE for the following DFA



6. Construct a transition system which can accept strings over the alphabets a,b,c, ... containing either 'cat' or 'rat'.

7. Estimate all unit production of the following grammar

$S \to Aa / B$

$B \to A / bb$

$A \to a / bc / B$

Group –C

Answer any one questions: **1x10 = 10**

8. a) Show that $L = \{a^n b^n c^n \mid n \geq 0\}$ is not context free.

   b) What is ambiguous grammar? Check whether following grammar is ambiguous or not

   $S \to aSbS / bSaS / \in$

9. a) Obtain the CFG for the following RE

   $(a+b)^* aa(a+b)^*$

   b) Design PDA for $L = \{WW^R \mid W \in (0+1)^*\}$

10. What is Chomsky classification of Grammars? Explain with proper example. 10

11. Design a FA from given regular expression $10 + (0+11)0^*1$.
