Computer Science [Honours]
[CBCS]
B.Sc. Fifth Semester End Examination-2023
(Regular & Supplementary Paper)
PAPER-C12T
[Theory of Computation]

Full Marks: 60   *Time: 03 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 TEN questions of the following: **10x2= 20**

a) State the difference between NFA and DFA.

b) What is ambiguous grammar? Give one example.

c) What are the applications of Turing Machine?

d) Define the term Epsilon transition.

e) Describe PDA.

f) Define Type-2 grammar in CFG.

g) What is Regular expressions.

h) If $G = (\{s\},\{a\},\{s \rightarrow ss\},s)$, find the language generated by G.

Group B

Answer any FOUR questions of the following: 4x5 = 20

2) Is the language $L = \{a^n b^n c^n \mid n \geq 1\}$ is context free? Justify.

3) Define Mealy Machine and Moore Machine. How does it differ?

4) What is Left-Recursion? How it can eliminate? Consider the following grammar and eliminate left recursion.

$A \rightarrow ABd \mid Aa \mid a$

$B \rightarrow Be \mid b$

5) Construct a deterministic automaton equivalent to

$m = (\{q_0, q_1\}, \{0,1\}, \delta, q_0, \{q_0\})$

Where δ is defined by the following

State / $\sum$	0	1
q_0	q_0	q_1
q_1	q_1	$q_0 q_1$

6) Consider the following grammar

$S \rightarrow as \mid AB$

$A \rightarrow \wedge$

$B \rightarrow \wedge$

$D \rightarrow b$

Construct a grammar with out null production

7) Construct a PDA A equivalent to the following CFG.

$S \rightarrow OBB$

$B \rightarrow os \mid is \mid o$

Group C

Answer any TWO question of the following: 2x10 = 20

8) What is the purpose of normalization? Construct the CNF and GNF for the following grammar and explain the steps.

$S \rightarrow aAa \mid bBb \mid \in$

$A \rightarrow C \mid a$

$B \rightarrow \mid b$

$C \rightarrow CDE \mid \in$

$D \rightarrow A \mid B \mid ab$

9) Classify grammars according to Chomsky. Define each of them with suitable examples.

10) Design a FA from given regular expression

$10 + (0+11)0*1$

11) Describe the following grammar G to CNF

$S \rightarrow aAD, A \rightarrow aB \mid bAB, B \rightarrow b, D \rightarrow d$