

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86.
(For candidates admitted during the academic year 2016 – 17 & thereafter)
B.Sc DEGREE SUPPLEMENTARY EXAMINATION NOVEMBER 2019
BRANCH I – MATHEMATICS
SUBJECT CODE 15MT/UI/FA23

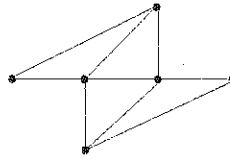
Course : Independent Elective
Paper : FORMAL LANGUAGES AND AUTOMATA THEORY
Max Marks: 100
Time : 3 Hours

SECTION – A
ANSWER ALL THE QUESTIONS **(10 × 2 = 20)**

1. Define a simple graph and a multigraph.
2. What is a walk and a path?
3. Explain a finite Automata.
4. When is a string accepted?
5. What is NFA?
6. Define a regular set.
7. Explain a phrase-structure grammar.
8. Define content-free and content-sensitive grammar.
9. When is a grammar said to be regular?
10. Give any two applications of Finite Automata.

SECTION-B
ANSWER ANY FIVE QUESTIONS **(5 × 8 = 40)**

11. Show that the sum of the degrees of the points of a graph G is twice the number of lines. Also show that the number of points of odd degree is even.
12. Define the adjacency and incidence matrix of a graph and obtain the same for the following graph:



13. a) Prove that every connected graph has a spanning tree.
b) Prove that every block of a tree is K_2 .
14. Construct a grammar for the language $L = \{a^m b^n : m \neq n, n > 0\}$.
15. Let $A = \{a, b\}$. Design a Finite State Automata, which will accept those words from A , where the number of b 's is divisible by three.

16. Construct the state diagram for the automation

$M = \{(q_0, q_1, q_3), (a, b), \partial, q_0, \{q_2\}\}$, where

$$\delta(q_0, a) = q_1, \delta(q_1, a) = q_1, \delta(q_2, a) = q_1,$$

$$\delta(q_0, b) = q_2, \delta(q_1, b) = q_1, \delta(q_2, b) = q_0$$

17. Find $\hat{\delta}(q_0, 1001)$ for NFA for $M = \{(q_0, q_1, q_2, q_3), (0, 1), \delta, q_0, \{q_3\}\}$

δ	0	1
q_0	q_0, q_1	q_0, q_2
q_1	q_1	-
q_2	=	q_3
q_3	q_3	q_3

SECTION-C

ANSWER ANY TWO QUESTIONS

(2 × 20 = 40)

18. a) Define a tree and give an example.

b) Let G be a (p, q) graph. Then prove that the following statements are equivalent:

i) G is a tree.

ii) Every two points of G are joined by a unique path.

iii) G is connected and $p=q+1$.

iv) G is acyclic and $p=q+1$.

(4+16)

19. Construct a deterministic finite automaton (FA) equivalent to

$M = (\{q_0, q_1, q_2, q_3\}, \{0, 1\}, \delta, q_0, \{q_3\})$. δ is given in the following table

δ'	a	b
q_0	q_0, q_1	q_0
q_1	q_2	q_1
q_2	q_3	q_3
q_3	-	q_2

20. Construct the Monoid for a parity checker

δ	0	1
q_0	$(q_0, 0)$	$(q_1, 1)$
q_1	$(q_1, 1)$	$(q_0, 0)$
