CLASS: MCA **15A / 242**

St. JOSEPH'S COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI – 620 002

SEMESTER EXAMINATIONS – APRIL 2015

TIME: 3 Hrs. **MAXIMUM MARKS: 100**

SEM	SET	PAPER CODE	TITLE OF THE PAPER
IV	2013	13PCA4123	GRAPH AND AUTOMATA THEORY

SECTION – A

Answer all the questions: **20 x 1 = 20**

Choose the correct answer:

1. The other term of an edge is a _____.
   a) Node b) Junction
   c) Branch d) 0-cell

2. A tree in which one vertex is distinguished from all the other is called _____.
   a) Binary tree b) Balanced tree
   c) Rooted tree d) Spanning tree

3. A balanced digraph is said to be _____if every vertex has the same in-degree and out-degree as every other vertex.
   a) Isomorphic b) Complete asymmetric
   c) Regular d) Simple asymmetric

4. A _____is an abstract entity.
   a) String b) Word
   c) Symbol d) Language

5. In a context free grammar G = (V, T, P, S) V is called
   a) Set of terminals b) Set of production rules
   c) Set of non-terminal d) Start symbols

Fill in the blanks:

6. Two nonparallel edges are said to be _____if they are incident on a common vertex.
7. The number of pendant vertices in a binary tree with ‘n’ vertices is _____.
8. A complete asymmetric digraph of ‘n’ vertices contains _____edges.
9. The concatenation of two languages L_1 and L_2 is denoted by _____.
10. If a grammar has different left most or different right most derivations for a same word, then it is called _____ grammar.

State True or False:

11. The degree of a vertex is sometimes also referred to as its valency.
12. A graph in which each vertex is assigned a unique name is called a labeled graph.
13. An isolated vertex is a vertex in which the in-degree and the out-degree are both equal to zero.
14. The empty string is the string consisting of zero symbols.
15. Every context-free language is context sensitive language.

Answer in one or two sentences:

16. What is complete graph?
17. Define fundamental circuits.
18. What is arborescence?
19. Define Deterministic Finite Automaton.
20. Define Derivation Tree.

SECTION – B

Answer all the questions: **5 x 7= 35**

21. a. Discuss any two operations on graphs.

OR

b. Prove that a connected graph G is an Euler graph if and only if it can be decomposed into circuits.

22. a. What is adjacency matrix? Give its properties.

OR

b. Prove that every connected graph has at least one spanning tree.

23. a. Write prim's algorithm to find minimum spanning tree of a graph.

OR

b. Explain the different computer representation of a graph.

24. a. Explain the different types of grammar.

OR

b. Explain the applications of finite automata.

25. a. State Griebach and Chomsky Normal Forms.

OR

b. State and prove Pumping lemma for context free language.

SECTION – C

Answer any THREE questions: **3 x 15 = 45**

26. (i) Prove that a given connected graph G is an Euler graph if and only if all vertices of G are of even degree. (10)

(ii) Prove that the number of vertices of odd degree in a graph is always even. (5)

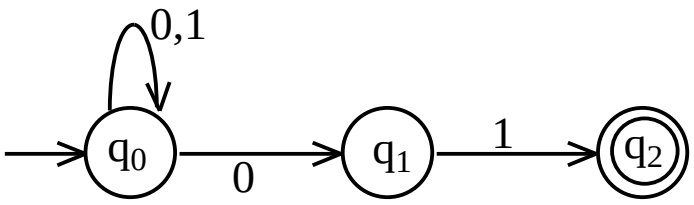
27. (i) Prove that every tree has either one or two centers. (8)

(ii) What is incidence matrix? Give its properties. (7)

28. (i) Explain Warshall's algorithm to find shortest path between all pairs of vertices in a graph. (10)

(ii) Describe an algorithm to find connectedness and components of a graph. (5)

29. (i) Convert the following NFA to its equivalent DFA. (10)



(ii) Obtain a DFA to accepts strings of a's and b's having even number of a's and b's. (5)

30. (i) Consider the CFG ({S, X}, {a, b}, P, S) where production are S→baXaS|ab, X→Xab|aa. Find left most derivation and right most derivation for the string w = baaaababaab. (5)

(ii) Covert the following productions of a grammar into Chomsky Normal Form: (10)

$S \rightarrow aB|bA$

$A \rightarrow a|aS|bAA$

$B \rightarrow b|bS|aBB.$

****