B. N. BANDODKAR COLLEGE OF SCIENCE, THANE - 400 601.

FIRST TERM EXAMINATION OCT. - 2010

S. Y. B. Sc.

TIME : 2 Hrs.

SUBJECT : MATHEMATICS - III **MARKS :** 60

N. B. : 1. All questions are compulsory.
2. In each question part (a) is compulsory.
3. Attempt ANY THREE questions from part (b).

Q.1 a) State Handshaking Theorem. How many edges are there in a graph with 10 vertices each of degree six. [3]

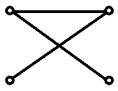
b) Attempt ANY THREE of the following.

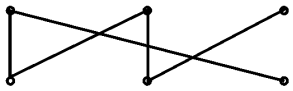
i) Write an algorithm which will find the factorial (n!) of an inputed positive integer. [4]

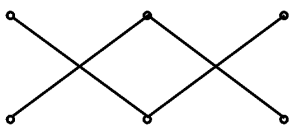
ii) Explain each of these in one line.
a) Parent of a vertex
b) A child of a vertex
c) A sibling of a vertex
d) The ancestor of a vertex. [4]

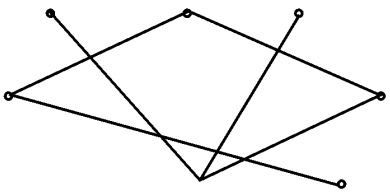
iii) Give definition for Big - O notation. Give big - O estimate for the sum $1 + 2 + 3 + \ldots\ldots + n$. [4]

iv) Which of the following are trees ? [4]

a) 

b) 

c) 

d) 

v) Define degree of a vertex, Hamilton path and Hamilton circuit. [4]

Q.2. a) Give the definition of an algorithm. Write an algorithm to accept three interger values and display the greatest integer. [3]

b) Attempt ANY THREE of the following :

i) Write an algorithm to display the sum

$$1 - \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \ldots\ldots\ldots\ldots + (-1)^n \frac{x^n}{n!}$$ [4]

ii) Write an algorithm to linear search for an inputed value x in an inputed array of n integers using recursion. [4]

iii) Let $f(n) = \frac{7}{3} n^5 + \frac{2}{7} n^2$ [4]

Check whether f (n) is a same order as $g(n) = n^5$

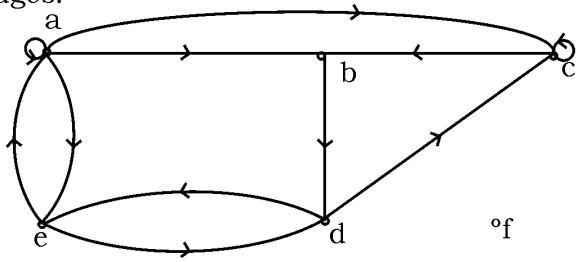
Or Show that $f = \theta(n^5)$. [4]

iv) Convert the given binary number into hexadecimal form

$(1\ \ 1001\ \ 1011)_2$

v) Write an algorithm to sort an inputed array in ascending order by Bubble sort. [4]

Q.3 a) Find the indegree and outdegree of each vertex in the given graph G with directed edges. [3]



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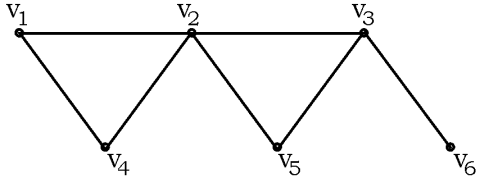
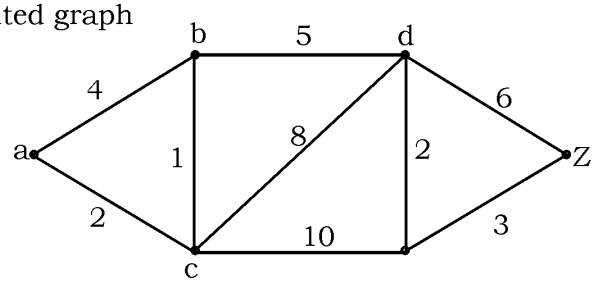
b) Attempt ANY THREE of the following.

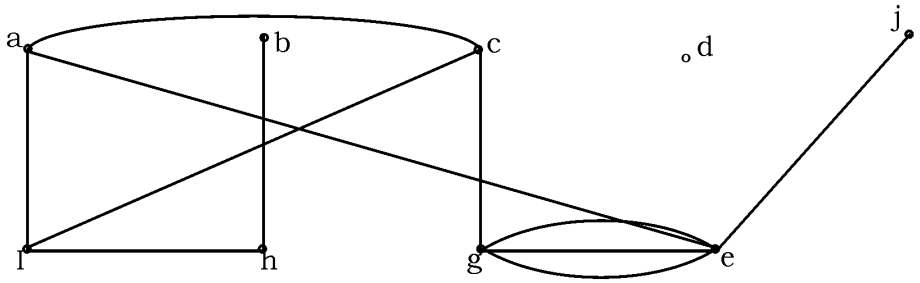
i) Represent the graph with adjacency matrix and incidence matrix [4]



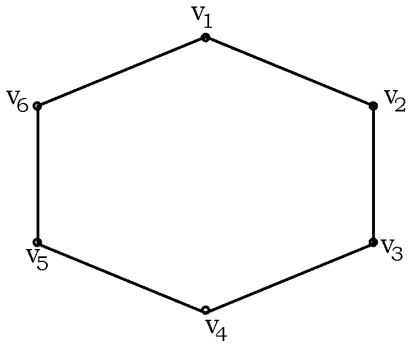
ii) Use Dijkstra's algorithm to find a shortest path from a to z in the given weighted graph [4]



iii) Find the number of vertices, no. of edges and degree of each vertex in the given undirected graph. Identify all isolated and pendent vertices. [4]



iv) Define complementary graph. Draw the complementary graph for the given graph. [4]



v) What do you mean by planargraph and its representation. State the theorem on Euler's formula. State Kuratowski's Theorem. [4]

Q.4 a) Define - Tree, Forest, Binary tree [3]

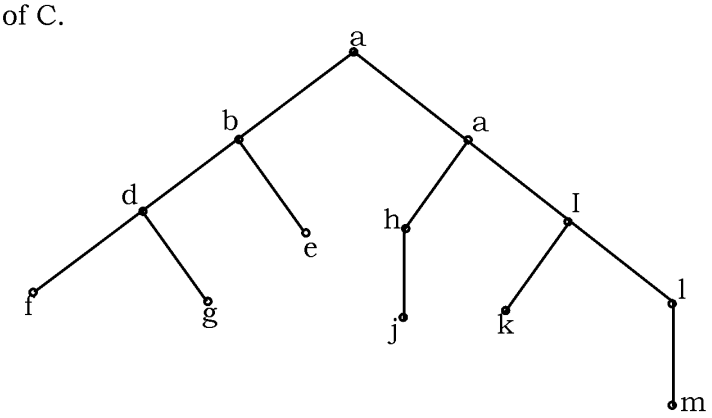
b) Attempt ANY THREE of the following :

i) Write any four properties of trees. [4]

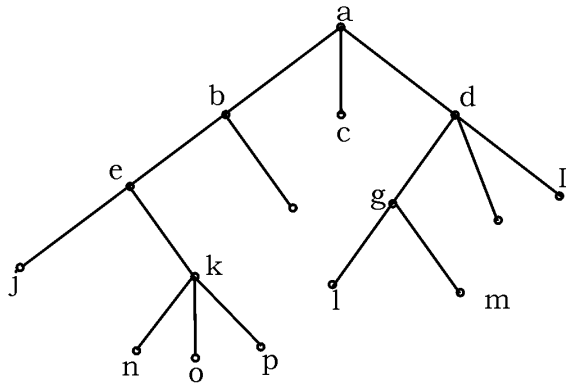
ii) Draw a Decision tree for sorting three distinct elements. [4]

iii) Which is the root of a given tree T ? What are the left and right children of d in the binary tree T ? What are the left and right subtree of C. [4]

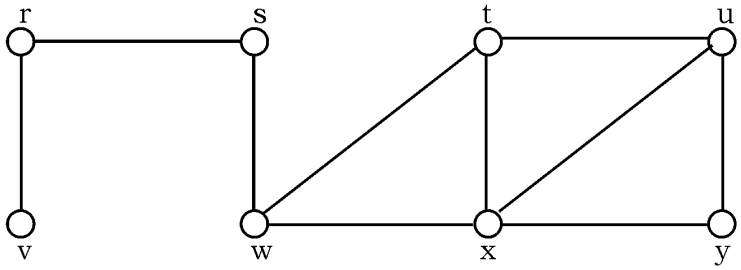
T :



iv) Write down the post-order and in-order traversal of a given tree T. [4]



v) Operate Breadth-first search (BFS) on given undirected graph. [4]



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