B.N. BANDODKAR COLLEGE OF SCIENCE

S.Y.B.SC A.T.K.T\ Failure Examination, Feb-2011

Mathematics Paper-III

Duration : 3 HRS Max. Marks : 90

N.B. All the questions are compulsory.

Q-1 A) **Give the definition of Algorithm.** **[3]**
Write an algorithm which will accept three positive integers and display the maximum among these.

B) **Attempt any three of the following :**

I. Convert the given binary number into octal form
$$(11001\ 0110)_2$$ **[4]**

II. Let $f(n) = \frac{7}{3} n^5 + \frac{2}{7} n^2$ **and** $g(n) = n^5$ **check whether f(n) is same order as** $g(n)$ **.** **[4]**

III. Write an algorithm which will find and display the area and circumference of a circle. **[4]**

IV. Write an algorithm to find transpose of a matrix of order m x n. **[4]**

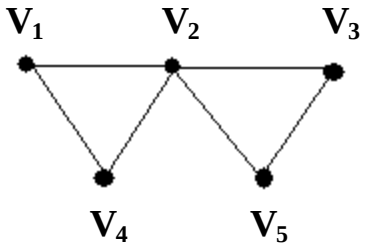
V. Write an algorithm which will find the factorial of an inputed positive integer, using recursion. **[4]**

Q-2 A) **State Handshaking Theorem. How many edges are there in a graph with Six vertices each of degree six.** **[3]**

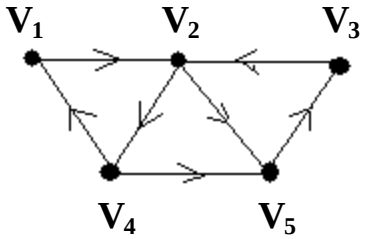
B)

Attempt any three of the following :

I. Represent the graph with adjacency matrix [4]

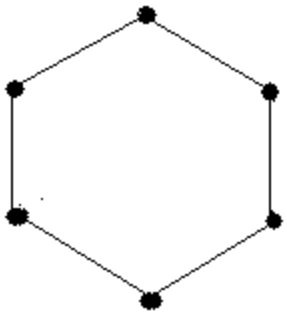


II. Find the in-degree and out-degree of each vertex in the given graph G with directed edges. [4]

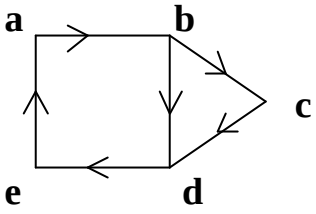


III. Give the example also draw the graph for
(1) Complete graph (2) Bipartite Graph [4]

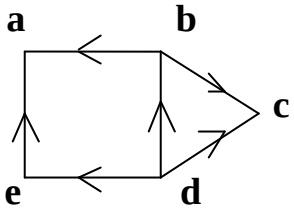
IV. Define Complementary graph. Draw the Complementary graph for the given graph. [4]



V. Are the directed graph G and H Strongly Connected ? Are they weakly connected? [4]



G



H

Q-3 A] **Define: Tree, Forest, Spanning Tree.** **[3]**

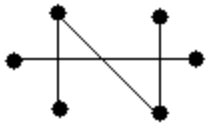
B] **Attempt any three of the following:**

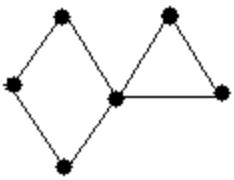
I. Write any four properties of tree. **[4]**

II. Operate BFS (Breadth First Search) method on a given . undirected graph to find spanning tree. **[4]**

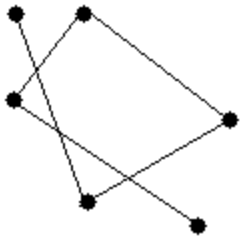
III. Which of the following are trees? **[4]**

a) **b)**





c) d)



IV. Prove that tree with n vertices has exactly n-1 edges. [4]

V. Explain each of these in one line: [4]

a. Parent of a vertex
b. A child of a vertex
c. A sibling of a vertex
d. Ancestor of a vertex

Q-4 A] Find the area of the region enclosed by $x=2y^2$, $x=0$ and $y=3$. [3]

B] Attempt any three of the following:

I. For what value of p, $\int_1^\infty \frac{dx}{x^p}$ converges and for what values of p, it diverges? [4]

II. Investigate the convergence of $\int_1^\infty e^{-x^2}\,dx$. [4]

III. State the Direct comparison Test and Limit form of comparison Test. [4]

IV. Find the value of [4]

$$\int_{-\infty}^{\infty} \frac{1}{1+x^2}\,dx$$

V. Test for convergence using direct comparison test. [4]

$$\int_1^\infty \frac{dx}{1+x^3}\,.$$

Q-5 A] **Derive the Newton-Raphson formula using Taylor series expansion.** [7]

B] **Attempt any two of the following:**

I. Explain Descarte's rule of signs. How many positive real roots the polynomial $p(x) = x^5 - 3x^3 + 2x^2 - x + 2$ has? [4]

II. Discuss the convergence of Newton Raphson method. [4]

III. Discuss the convergence of fixed point iteration method. [4]

IV. Factorise the matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$$

using Cholesky's method. [4]

Q-6 A] **Explain the Picard's method to solve the ordinary differential equation.** [7]

B] **Attempt any two of the following:**

I. Define order and degree of the differential equation. Hence find the degree and order of

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 2y = x^2$$

[4]

II. Explain Euler's method to solve the ordinary differential equation. [4]

III. Write the formula for Adams Bashforth predictor and Adams- Moulton corrector. [4]

IV. Explain Taylor Series method for solving the ordinary differential equation. [4]