APRIL – 2015

B.C.A. Semester – 1

Examination

Paper – 106: Discrete Mathematics and Introduction to Graph Theory

Time: 2 ½ Hours — 2563 **Total Marks: 70**

Q.1 (a) If A is a set of letters of the word 'MATHEMATICS', B is a set of letters of the word 'MATLAB' and C is a set of letters of the word 'MATERIAL' then find (i) B – C (ii) A – C (iii) $A \cup (B \cap C)$ (iv) $(A \cup B) \cap (A \cup C)$ [7]

(b) Given that $f(x) = x^2 + 2x + 5$. Find x if $f(x + 1) = f(x - 1)$. [7]

OR

Q.1 (a) In an examination of 100 students 75 students passed in Paper – 1, 85 students passed in Paper – 2. If 30 students are failed in both the papers then find the number of students who have passed in both the papers. [7]

(b) Prove that a function f: R – {3} → R – {0} given by $f(x) = \frac{1}{x-3}$ is one-one and onto. Also find inverse function of f. [7]

Q.2 (a) If $\bar{a} = (2,3,6)$ *and* $\bar{b} = (3,-6,2)$ then find $\bar{a} \times \bar{b}$, $\bar{a} \cdot \bar{b}$ and $|\bar{a} + \bar{b}|$. [7]

(b) Find the inverse of a matrix $A = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$ [7]

OR

Q.2 (a) Find two vectors, each of magnitude 5, which are perpendicular to both the vectors (1, –1, 1) and (2, 3, –1). [7]

(b) If $A = \begin{bmatrix} 3 & 4 \\ -2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} -4 & 2 \\ 3 & 5 \end{bmatrix}$ and $C = \begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix}$ then verify the following: [7]

(i) (A + B) + C = A + (B + C) and (ii) 3(A – B) = 3A – 3B

Q.3 (a) How many different numbers of 3 digits can be made using digits 0, 1, 2, 3, 4, 5, 6, 7 such that (i) No digit is repeated (ii) repetition of digit is allowed? [7]

(b) Write an algorithm for finding dot product of two vectors. [7]

OR

Q.3 (a) 3 ladies, 2 gents and 2 children go for a movie. How many different seating arrangements can be done in a line so that (i) Children are never given the end seats, (ii) Gents occupy the end seats. [7]

(b) Write an algorithm for finding addition of two matrices. [7]

Q.4 (a) Explain the following terms with example: [7]

(i) Adjacent vertices (ii) Degree of a vertex (iii) Regular graph (iv) Isolated vertex

(b) Draw the following graphs: [7]

(i) 3-regular graph with 6 vertices (ii) K_5 (iii) $K_{2,4}$

OR

Q.4 (a) Define the following terms and give one example of each: [7]

(i) Closed walk (ii) Connected graph (iii) Circuit (iv) Labeled graph

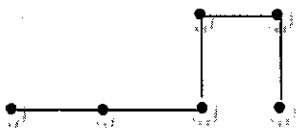
(b) Write a brief note on isomorphism of graphs. [7]

Q.5 (a) What is Eulerian graph? Draw one Eulerian ane one non-Eulerian graph. [7]

(b) Describe Travelling Salesman problem. [7]

OR

Q.5 (a) Find eccentricity of each vertex and hence find the centre of the following graph: [7]



(b) Write a short note on Konigsberg Bridges Problem. [7]
