

This question paper contains 8 printed pages]

Your Roll No.....

5173

B.Sc.(Prog.)/III

B

EL 310 (VII) – Computational and Discrete Mathematics

(Admissions of 2005 and onwards)

Time : 2 Hours

Maximum Marks : 38

(Write your Roll No. on the top immediately on receipt of this question paper.)

All the Sections are compulsory.

Use of scientific calculator is allowed.

SECTION I

1. By Euler's method, find $y(0.6)$ by taking $h = 0.2$ of the following differential equation 6

$$\frac{dy}{dx} = x - 2y, \quad y(0) = 1.$$

Or

Evaluate $y(0.1)$ correct to six places of decimals by Taylor's

series method if $y(x)$ satisfies $\frac{dy}{dx} = xy + 1, \quad y(0) = 1.$

P.T.O.

SECTION II

2. (a) Define dual of a statement. Find duals of the following :

(i) $\bar{x} \cdot \bar{y}$;

(ii) $(x + \bar{z}) \cdot (0 + x) \cdot (\bar{x} + 1)$.

- (b) What values of the Boolean variables x and y satisfy

$$xy = x + y ?$$

5

Or

- (a) Find the values, if any, of the Boolean variable x that satisfy these equations :

(i) $x \cdot \bar{x} = 1$;

(ii) $x + x = 0$;

(iii) $x \cdot 1 = x$.

- (b) Prove the absorption law $x(x + y) = x$.
3. (a) Draw a Karnaugh map for a function in four variables and put 1 in a square that represents

$$\bar{w} x y \bar{z}$$

- (b) Which minterms are represented by squares adjacent to this square ?

5

Or

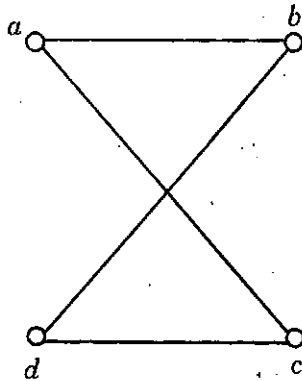
A committee of three individuals decides issues for an organization. Each individual votes either yes or no for proposal. A proposal is passed if it receives at least two yes votes. Design a circuit that determines whether a proposal passes.

SECTION III

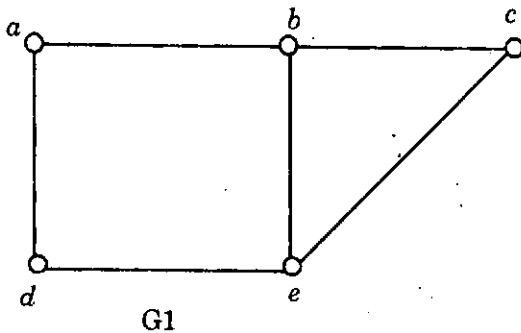
4. Attempt any two parts :

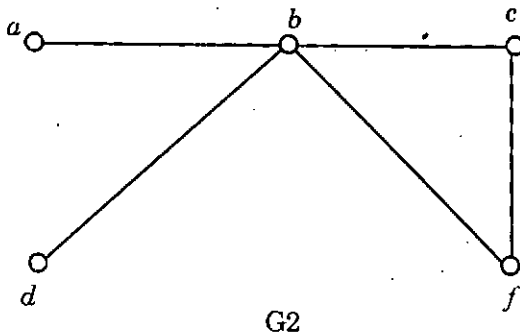
3+3

- (i) How many paths of length four are there from a to d in a simple graph G as shown in Figure ?



- (ii) Define union of two graphs. Find the union of the following graphs G_1 and G_2 :



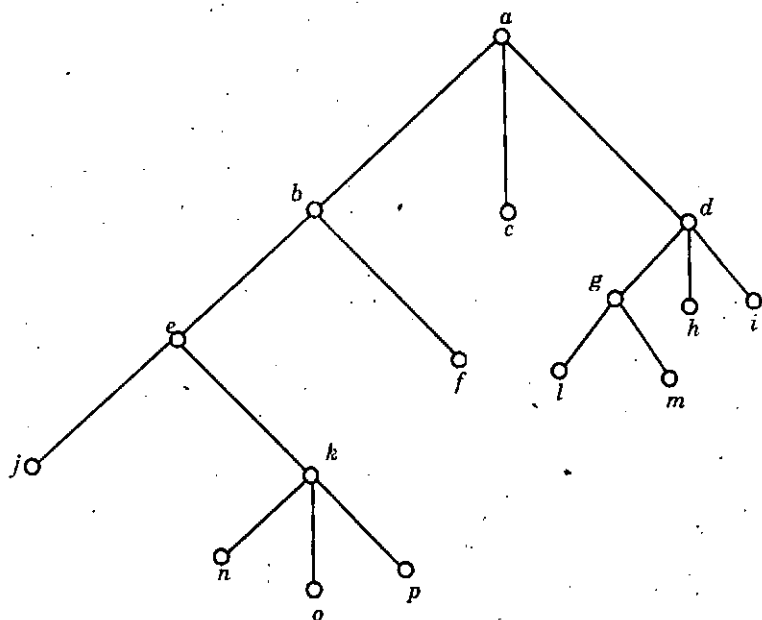


(iii) Define bipartite graph. Give two examples of bipartite graphs.

5. Attempt any two parts : 3+3

(i) Define a tree. Prove that an undirected graph is a tree if and only if there is a unique simple path between any two of its vertices.

- (ii) In which order does an inorder transversal visit the vertices of the following ordered rooted tree T :



- (iii) Draw graphs with the following adjacency matrices :

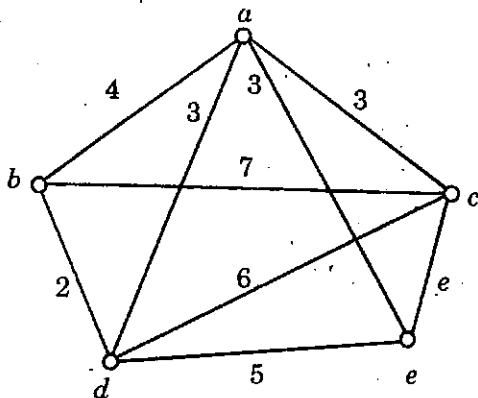
$$(a) \begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

$$(b) \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

6. Attempt any *one* part :

4

- (i) Using Kruskal's algorithm, find the minimal spanning tree for the following weighted graph :



- (ii) Prove that a simple graph is connected if and only if it has a spanning tree.

SECTION IV

7. (a) Write the pseudocode for finding the sum of first 20 even numbers.
- (b) Obtain asymptotic lower bound for $6n^2 + 1$. 6

Or

- (a) What does the following algorithm in pseudocode compute after its execution ? N is assumed to be positive integer :

$x = 0$

$y = 0$

while ($x < N$) }

$x = x + 1$

$y = y + x$

}

print y

- (b) Obtain asymptotic lower bound for $3 + 9 + 27 + 81 + \dots + 3^n$.