This question paper contains 6 printed pages.]

Your Roll No ....

5238

B.Sc. Prog. / III J

EL – 310 (VII) – COMPUTATIONAL AND DISCRETE MATHEMATICS

(NC – 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. Evaluate y(0.1) correct to six places of decimals by Taylor's series method if $y(x)$ satisfies $\frac{dy}{dx} = xy + 1, y(0) = 1$ **6**

OR

Solve the differential equation $\frac{dy}{dx} = \frac{y - x}{y + x}$ with initial condition y(0) = 1 by the simple Euler's method with h = 0.02 to get y(0 1)

SECTION – II

2. Construct circuits that produce the following outputs : 5

(a) $\overline{(x + y)}x$

(b) $\bar{x} + y$

(c) $\bar{x}yz + x\bar{y}z$

OR

Define dual of a Boolean expression. Find the duals of the following Boolean expressions

(a) $xyz + \bar{x}\,\bar{y}\,\bar{z}$

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

(c) $\bar{x}\,\bar{y}$

3 Draw the Karnaugh maps of the following sum of products expansion in three variables : 5

(a) $x\bar{y}z + x\,\bar{y}\,\bar{z} + \bar{x}yz + \bar{x}\,\bar{y}\,z + \bar{x}\,\bar{y}\,\bar{z}$

(b) $xyz + xy\bar{z} + x\bar{y}z + x\,\bar{y}\,\bar{z} + \bar{x}yz + \bar{x}\,\bar{y}\,z + \bar{x}\,\bar{y}\,\bar{z}$

(c) $x\,\bar{y}\,\bar{z}$

OR

(a) What are don't care conditions ?

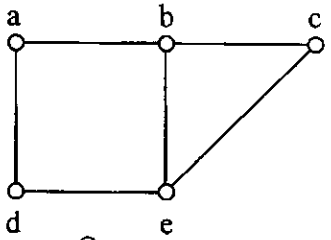
(b) Draw a Karnaugh map for a function in four variables and put a 1 in a square that represent $\bar{w}xy\bar{z}$.

(c) Find a minterm that equals 1 if $x_1 = x_4 = 0$ and $x_2 = x_3 = x_5 = 1$, and equals 0 otherwise

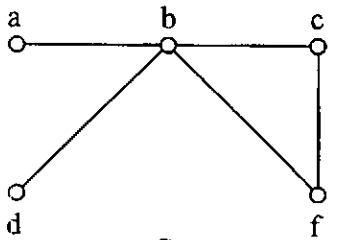
SECTION – III

4 Attempt any **two** parts **3 + 3**

(i) Define union of two graphs Find the union of the following graphs G_1 and G_2



G_1



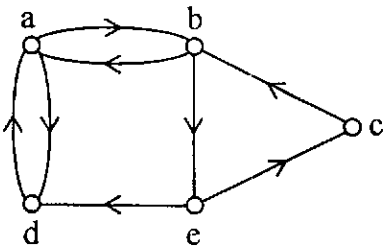
G_2

(ii) Define the in-degree and out-degree of a vertex in a directed graph What do the in-degree and out-degree of a vertex in a directed graph modeling a round-robin tournament represent ?

(iii) Determine which of the following lists of vertices form a path in the following directed graph Justify your answer What are the lengths of those that are paths ?

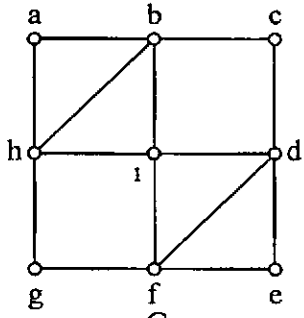
(a) a, b, e, c, b

(b) a, d, b, e, a



5 Attempt any **two** parts **3 + 3**

(i) Define an Euler circuit. State the necessary and sufficient condition for the existence of an Euler circuit in a connected multigraph. Determine with reasons whether the following graphs have an Euler circuit Construct such a circuit if it exists



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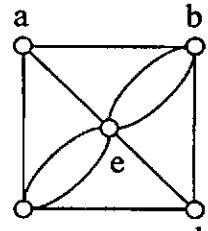


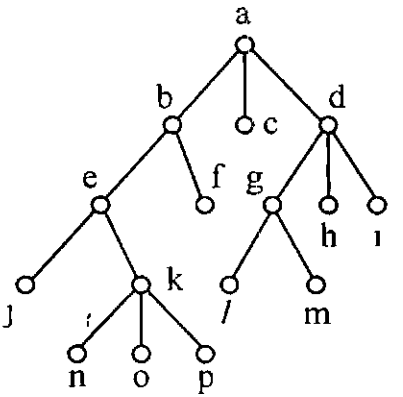
H

(ii) What do you understand by saying that a graph is weekly connected ? Give an example of a graph which is weekly connected but not strongly connected Full explanation is required

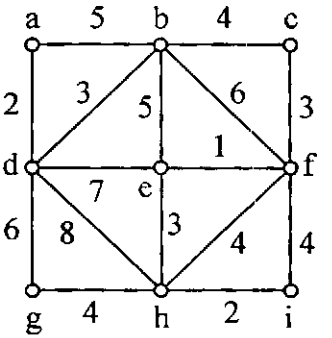
(iii) Define a tree Prove that an undirected graph is a tree if and only if there is a unique simple path between any two of its vertices

6 Attempt any **one** part **4**

(i) Define an inorder traversal of an ordered rooted tree In which order does an inorder traversal visit the vertices of the ordered rooted tree T shown below All steps have to be figured out clearly



(ii) Use Kruskal's algorithm to find a minimum spanning tree for the following weighted graph



7. (i) What is the difference between the functions "print" and "print ln" for output. 2

(ii) Show that $n! = 0(n^n)$ 2

(iii) Explain the general form of "do while loop" used in Pseudo codes for algorithms 2

OR

(i) Write a Pseudo code for finding the maximum value in an Array of n elements using a "For loop". 4

(ii) Show that $2^n = 0(n^1)$ 2
