

2125  
B.Sc. Data Analytics (FYUP)  
First Semester  
Paper: Basics of Mathematics

Time allowed: 3 Hours

Max. Marks: 90

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting one question from each Unit.

x-x-x

I. Attempt the following:-

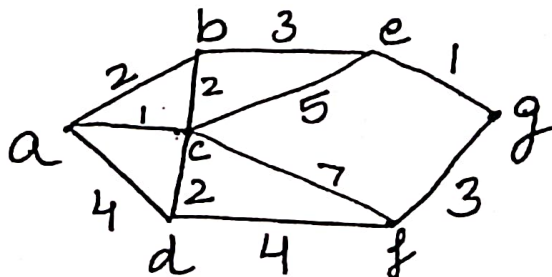
- Prove that  $B \cup (A - B) = A \cup B$ .
- Find the area of parallelogram whose adjacent sides are given by the vectors  $\vec{a} = 3\hat{i} + \hat{j} + 4\hat{k}$  and  $\vec{b} = \hat{i} - \hat{j} + \hat{k}$ .
- State and prove Eulers formula.
- Define principle of duality for a lattice.
- Find the domain and range of  $f(x) = \sqrt{9-x^2}$
- Define symmetric and skew-symmetric matrices. (6x3)

UNIT - I

- There are 200 individuals with skin disorder, 120 had been exposed to chemical  $C_1$ , 50 to Chemical  $C_2$ , 30 to both chemicals  $C_1$  and  $C_2$ . Find the number of individuals exposed to:-
    - Chemical  $C_1$  or Chemical  $C_2$
    - Chemical  $C_1$  but not Chemical  $C_2$
    - Chemical  $C_2$  but not Chemical  $C_1$
  - Prove that  $f : \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = x^2 + 3$  is neither one-in-one nor out. (2x9)
- Define equivalence relation. (2x9)
  - Explain identity function and greatest integer function. (2x9)

UNIT - II

IV. Find the shortest path from a to g.



(18)

P.T.O.

(2)

V. Find the eigen values and the corresponding eigen vectors of the matrix A, where

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix} \quad (18)$$

### UNIT - III

VI. a) Consider the Boolean algebra  $D_{48}$ , the divisors of 48 under the binary operations ' $\vee$ ' and ' $\wedge$ ' defined by  $a \vee b = \text{l.c.m.}(a,b)$ ,  $a \wedge b = \text{g.c.d.}(a,b)$ .

Determine the values of

i)  $p = 24 \wedge (2 \vee 3)$

ii)  $q = (6 \wedge 8) \vee 16$

iii)  $r = (3 \vee 8) \wedge (12 \wedge 24)$

b) Write the circuit diagram of the Boolean function.

$$f(x_1, x_2, x_3) = (x_1 \cdot x_2 + x_3) \cdot (x_2 + x_3) + x_3 \quad (2 \times 9)$$

VII. Explain digital network and switching circuit. (18)

### UNIT - IV

VIII. a) Give the geometrical representation of addition of two vectors.

b) Prove that  $(\vec{a} + \vec{b}) \cdot (\vec{a} + \vec{b}) = |\vec{a}|^2 + |\vec{b}|^2$  iff  $\vec{a}$  and  $\vec{b}$  are perpendicular,  $\vec{a} \neq 0, \vec{b} \neq 0$ . (2x9)

IX. a) Find the angle between the line  $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$  and the plane  $10x + 2y - 11z = 3$ .

b) Show that  $\vec{A} = -2\hat{i} + 3\hat{j} + 5\hat{k}$ ,  $\vec{B} = \hat{i} + 2\hat{j} + 3\hat{k}$  and  $\vec{C} = 7\hat{i} - \hat{k}$  are collinear. (2x9)

x-x-x