3 SEM BCA (CBCS) MTH–III 3·1

2024

(December)

COMPUTER APPLICATION

Paper : 3·1

(Mathematics–III)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following : 2×5=10

   (i) Define group.

   (ii) What is ring ?

   (iii) Define Integral Domain.

   (iv) What is eigenvalue ?

   (v) Give an example of weighted graph.

2. Answer the following :

   (a) Is the set I of integers a group— 1×2=2

      (i) with respect to subtraction

      (ii) with respect to multiplication ?

(b) Show that the set of all positive rational numbers forms an abelian group under the composition defined by $a * b = ab/2$. 5

Or

(c) Show that the set $G = \{a + b\sqrt{2} : a, b \in Q\}$ is a group with respect to addition.

(d) Prove that the identity element in a group is unique. 2

(e) Let I be the set of all integers defined by $a * b = a + b + 1$. 4

Determine the identity element in I and determine the inverse of a.

3. Answer the following :

(a) What is subgroup ? Give example. 2+2=4

(b) Prove that the inverse of any element of a subgroup is the same as the inverse of the same regarded as an element of the group. 3

(c) Show that the union of two subgroups is not necessarily a subgroup. 3

4. Answer the following :

(a) Prove that the set $G = \{1, 2, 3, 4, 5, 6\}$ is a finite abelian group of order 6 with respect to multiplication modulo 7. 5

(b) Show that the set $R = \{0, 1, 2, 3, 4, 5\}$ is a commutative ring with respect to '$+_6$' and '$\times_6$' as the two ring composition. 6

Or

(c) Define the following : ***(any three)*** $2 \times 3 = 6$

(i) Ring with unity

(ii) Zero-divisor

(iii) Integral Domain

(iv) Field

5. Answer the following :

(a) Define vector space. State the difference between vector and vector space with example. 2+3=5

(b) State the following laws in vector space for scalar multiplication : 3

(i) Distributive law

(ii) Associative law

(iii) Unitary law

6. Answer the following :

(a) Define a graph. Differentiate simple graph from multigraph with suitable example. 1+3=4

(b) Define path and circuit. Give an example of a Hamiltonian circuit. 4

Or

(c) Explain the process of finding shortest path using Dijkstra's algorithm with suitable example.
