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1 SEM BCA (CBCS) MTH 1·2

2024

(December)

COMPUTER APPLICATION

Paper : 1·2

(Mathematics–I)

Full Marks : 60

Time : Three hours

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

1. Answer the following : $2\times5=10$

   (a) Give *one* example of a set.

   (b) What is cardinality of a set ?

   (c) If $A=\{1, 2, 3, 4\}$ and $B=\{2, 4, 6\}$, then find $A\cap B$.

   (d) Define transitive relation.

   (e) What is tautology ?

2. Answer the following :

   (a) If $A=\{1, 2\}$ and $B=\{3, 4\}$, find $A\times B$ and $B\times A$. 2

Contd.

(b) Let a set X contain n elements. How many relations will there be on X ? 2

(c) Let $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. A relation R on X is defined as ${}_xR_y$ if and only if $x^2 = y(x, y \in X)$. Find the elements, domain and range of R. 3

(d) If a relation R on a set X is symmetric, show that R^{-1} is also symmetric. 3

(e) Let $A = \{1, 2, 3, 4\}$. Determine whether the following relations are transitive :

$$R_1 = \{(1, 2), (2, 3), (1, 3), (3, 2)\}$$

$$R_2 = \{(2, 3), (3, 4), (2, 4), (3, 1), (2, 1)\}$$

1×2=2

3. Answer the following :

(a) Define one-one function and onto function with example. 2+2=4

(b) What is characteristic function ? 2

(c) Let R be a relation defined on a set of positive integers such that $\forall x, y \in Z^+$ ${}_xR_y$ if and only if $x-y$ is divisible by 3. Prove that R is an equivalence relation. 4

Or

(d) If R and S are equivalence relations on a set X, check whether $R \cup S$ is an equivalence relation on X.

4. Answer the following :

(a) Form the conjunction of p and q for each of the following : 2

(i) p : Ram is healthy
q : Ram is a good football player

(ii) p : It is cold q : It is raining

(b) Find truth value to each of the following: 2

(i) $5 < 5 \vee 5 < 6$

(ii) $5 \times 4 = 21 \vee 9 + 7 = 17$

(c) Construct the truth table for the following proposition : 5

$$\sim(p \vee q) \vee (\sim p \wedge \sim q)$$

Or

(d) Show that $p \to q \equiv \sim q \to \sim p$

(e) Write the negation of the following proposition :
p : All students are intelligent
1

5. Answer the following :

(a) Briefly explain about modulus and argument of a complex number. 2

(b) Put the complex number $\left(\frac{2+i}{3-i}\right)^2$ in polar form. 3

(c) Expand the following determinant :

$$\begin{vmatrix} 1 & 3 & 7 \\ 4 & 9 & 1 \\ 2 & 7 & 6 \end{vmatrix}$$ 4

Or

Write the properties of determinant.

(d) Define the following : ***(any three)*** 2×3=6

(i) Row matrix

(ii) Null matrix

(iii) Diagonal matrix

(iv) Symmetric matrix

(e) What is permutation ? In how many ways can 6 students arrange themselves in a row if 2 particular students always sit together ? 1+2=3