

BCA 1st Semester Exam., 2024

BASIC MATHEMATICS

Time : 3 hours

Full Marks : 60

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **SEVEN** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question Nos. 1 and 2 are compulsory.

1. Choose the correct option (any six) : $2 \times 6 = 12$

(a) Let A be a finite set of size n . The number of elements in the power set of $A \times A$ is

(i) 2^{2n}

(ii) 2^{2^n}

(iii) $(2^n)^2$

(iv) None of these

(b) Transitivity and irreflexivity imply

(i) symmetric

(ii) reflexive

(iii) irreflexive

(iv) asymmetric

- (c) In how many ways can a party of 7 persons arrange themselves around a circular table?
- (i) $6!$ (ii) $7!$
(iii) $5!$ (iv) 7
- (d) Find the number of relations from $A = \{\text{cat, dog, rat}\}$ to $B = \{\text{male, female}\}$.
- (i) 64 (ii) 6
(iii) 32 (iv) 15
- (e) Suppose $|S| = 8$. How many subsets of S contain more than 5 elements?
- (i) 56 (ii) 93
(iii) 37 (iv) 28
- (f) The number 2008 is in decimal. Convert it to hexadecimal.
- (i) 7D8 (ii) 820
(iii) 728 (iv) 8D0
- (g) Let $A = \{1, 2, 3, 4\}$ and
 $R = \{(a, b) \mid a + b > 2\}$
Then R is
- (i) symmetric (T), transitive (T)
(ii) symmetric (T), transitive (F)
(iii) symmetric (F), transitive (T)
(iv) symmetric (F), transitive (F)

(h) Let S be a set of n elements. The numbers of ordered pairs in the largest and the smallest equivalence relations on S are

(i) n and n (ii) n^2 and n

(iii) n^2 and 0 (iv) n and 1

(i) Physically, integrating $\int_a^b f(x) dx$ means finding the

(i) area under the curve from a to b

(ii) area to the left of point a

(iii) area to the right of point b

(iv) area above the curve from a to b

2. Answer any *three* of the following : $4 \times 3 = 12$

(a) Find the number of positive integers lying between 100 and 500 (both inclusive) but **not** divisible by 2 and 5.

(b) In a survey of 85 people it is found that 31 like to drink milk, 43 like coffee and 39 like tea. Also, 13 like both milk and tea, 15 like milk and coffee, 20 like tea and coffee and 12 like none of the three drinks. Find the number of people who like all the three drinks. Display the answer using a Venn diagram.

(c) If R is a relation 'less than' from $A = \{1, 2, 3, 4\}$ to $B = \{1, 3, 5\}$, then find $R \circ R^{-1}$.

(d) In an examination, there are 15 questions of type True or False. How many sequences of answers are possible?

(e) Find the value of

$$\int_0^2 \frac{dx}{\sqrt{x^2 + 4x}}$$

3. Find $\int \sin^2 x \cos 3x \, dx$. 12

4. Find the fourth derivative of $x^3 \sin x$ with respect to x , using Leibnitz theorem. 12

5. Find the length of the curve

$$y = \frac{e^x + e^{-x}}{2}$$

as x runs from 0 to 1. 12

6. What is the area of the region completely bounded by the curve $x^2 = 4y$ and the line $y = 5$? 12

7. One kind of bacteria y grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in years. If the amount of the bacteria doubles every 5 days, then find the value of k . 12

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