



203

AAH-6103

Seat No. 1131

B. C. A. (Sem. II) Examination

April / May - 2018

BCA - 203 : Discrete Mathematics

Time : 3 Hours]

[Total Marks : 70

Instructions : (1) Figures to the right indicate full marks.

(2) Be precise and to the point in your answer.

1 (a) Answer the following questions : 8

(1) Define : Empty Set, Power Set.

(2) If $A = \{b, c, e, f, h\}$; $B = \{a, d, g, h, i\}$ then find $A \cup B, A \cap B$.

(3) What is the power set of the set $A = \{0, 1, 2\}$?

(4) Define : Intersection and Union of two sets.

(b) Attempt any two : 10

(1) If $A = \{1, 2, 3\}$; $B = \{3, 5\}$ and $C = \{2, 3, 5\}$ then find $n(A \Delta B), n(A - B)$ and $n((A \times B) \cap (A \times C))$.

(2) In a group of 70 persons, 37 likes coffee, 52 like tea and each person likes at least one of the two drinks. Calculate :

(a) How many people like both coffee and tea

(b) How many like coffee but not tea.

(3) State De Morgan's laws and prove that $(A \cup B)' = A' \cap B'$.

2 (a) Do as directed :

7

(1) If $f : A \rightarrow B$, $A = \{x/x \in \mathbb{N}, 1 \leq x \leq 4\}$ and $f(x) = 2x+3$, find the domain and range of function f . 2

(2) If $f(x) = x^2$; $g(x) = 5x-6$ then find the value of $f(3)$, $g(3)$ and $(f+g)(3)$. 2

(3) If $f(x) = \frac{1+e^x}{1-e^x}$ then prove that $f(-x) = -f(x)$. 3

(b) Attempt any two :

10

(1) Let $X = \{1, 2, 3, 4\}$. Determine whether or not each relation below is a function from X to X .

(i) $f : \{(2, 3), (1, 4), (2, 1), (3, 2), (4, 4)\}$

(ii) $g : \{(3, 1), (4, 2), (1, 1)\}$

(iii) $h : \{(2, 1), (3, 4), (1, 4), (2, 1), (4, 4)\}$

(iv) $s : \{(1, 1), (2, 2), (3, 3), (4, 1)\}$

(v) $t : \{(1, 2), (2, 3), (3, 4)\}$

(2) Let a and b be positive integers and suppose Q is defined recursively as follows :

$$Q(a, b) = \begin{cases} 0 & ; \text{ if } a < b \\ Q(a-b, b) + 2 & ; \text{ if } a \geq b \end{cases}$$

Find $Q(25, 4)$ and $Q(30, 10) + Q(10, 30)$.

(3) If $\log_2 [\log_3 (\log_2 x)] = 1$ then prove that $x = 512$.

3 (a) Answer the following :

8

(1) Define addition of two matrices and scalar product of a matrix.

(2) Obtain the values of determinants :

$$\begin{vmatrix} 3 & 5 \\ 2 & -10 \end{vmatrix} \text{ and } \begin{vmatrix} 1 & 0 & 3 \\ -3 & 4 & 5 \\ -3 & 4 & 5 \end{vmatrix}$$

(3) Define :

(i) Row Matrix

(ii) Column Matrix

(iii) Square Matrix

(iv) Diagonal Matrix

(4) State any two rules of determinant.

(b) Attempt any two :

10

(1) If $A = \begin{bmatrix} 1 & 3 \\ 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 5 \\ 1 & 6 \end{bmatrix}$ then find AB and BA .

(2) If $A = \begin{bmatrix} 2 & 5 & 0 \\ 0 & -1 & -3 \\ 9 & -4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -5 \\ 4 & 0 \\ -1 & -9 \end{bmatrix}$ then find $A \cdot B$.

(3) If $A = \begin{pmatrix} 3 & 1 & 3 \\ 0 & 5 & -8 \\ 3 & 0 & -1 \end{pmatrix}$ then find A^{-1} .

4 (a) Answer the following : 7

(1) Find ${}_{12}P_2$ and ${}_3C_2$. 2

(2) What is the 12th term of the arithmetic Progression 2, 7, 12, 17, 22,? 2

(3) Find n if ${}_{11}P_n : {}_{12}P_n = 3:4$. 3

(b) Attempt any two : 10

(1) Find the sum of the first 15 terms of the arithmetic progression : 4, 11, 18,.....

(2) Find the sum of the first five terms of Geometric Progression with first term -24 and common ratio $-\frac{1}{2}$.

(3) Find the first five terms of the arithmetic progression whose 4th and 11th terms of 30 and 107, respectively.