



I Semester B.C.A. Degree Examination, November/December 2016
(CBCS) (F+R)
(2014-15 & Onwards)
BCA – 105 : DISCRETE MATHEMATICS

Time : 3 Hours

Max. Marks : 100

Instruction : Answer **all** Sections.

SECTION – A

I. Answer **any ten** :

(10×2=20)

1) If $A = \{x | x \in \mathbb{N} \text{ and } x < 3\}$ and $B = \{0, 1, 3\}$. Find $A - B$.2) If $A = \{1, 2, 3\}$, $B = \{3, 4, 5\}$ and $C = \{0, 2, 3\}$, find $(A \cap B) \times C$.3) Construct truth table for the proposition $p \vee \sim q$.4) Find x, y, z if $\begin{bmatrix} 4-y & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} -1 & z+1 \\ 1 & 5 \end{bmatrix}$.5) If $A = \begin{bmatrix} 1 & -2 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 & 3 \\ 3 & 1 & 4 \end{bmatrix}$, find AB .6) Find the characteristic equation of the matrix $\begin{bmatrix} 1 & -2 \\ 3 & 0 \end{bmatrix}$.7) Prove that $\log_b a \cdot \log_c b \cdot \log_a c = 1$.8) Find n if $2 \cdot ({}^n P_3) = {}^n P_5$.9) On the set of integers Z , the binary operation $*$ is defined by

$$a * b = \frac{ab}{3}, \forall a, b \in Z. \text{ Find identity element.}$$

10) If $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{b} = \hat{i} - \hat{j} + 2\hat{k}$ find unit vector along $\vec{a} - \vec{b}$.



- 11) Find the midpoint of line joining $(-2, 8)$ and $(1, -2)$.
- 12) Find the equation of the line passing through $(-1, 2)$ and having slope 3.

SECTION – B

II. Answer **any six** of the following : **(6×5 =30)**

- 13) If $A = \{1, 4\}$, $B = \{2, 3, 6\}$, $C = \{2, 3, 7\}$ then verify that $A \times (B - C) = (A \times B) - (A \times C)$.
- 14) Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 4x + 3$ is invertible. Find the inverse of f .
- 15) Show that $p \vee (q \wedge r) \leftrightarrow [(p \vee q) \wedge (p \vee r)]$ is a tautology.
- 16) If $(p \rightarrow q) \wedge (p \wedge r)$ is given to be false, find the truth values of p, q, r .
- 17) Write the truth table of $(p \vee q) \vee \sim p$. Show that the compound propositions $p \wedge q$ and $\sim (p \rightarrow \sim q)$ are logically equivalent.

18) Find the inverse of the matrix $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$.

19) Using Cramer's rule solve $3x - y + 2z = 13$; $2x + y - z = 3$; $x + 3y - 5z = -8$.

20) Verify Cayley Hamilton theorem for the matrix $\begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$.

SECTION – C

III. Answer **any six** of the following. **(6×5 =30)**

21) If $\log \left(\frac{a-b}{5} \right) = \frac{1}{2}(\log a + \log b)$, show that $a^2 + b^2 = 27 ab$.

22) Find the number of three digit even numbers that can be formed using 2, 3, 4, 5, 6 repetitions being not allowed.

23) If ${}^{n+2}C_8 : {}^{n-2}P_4 = 57 : 16$ find n .



- 24) Prove that the set $G = \{ 3n \mid n \in \mathbb{Z} \}$ is an abelian group w.r.t. addition.
- 25) Prove that the set $G = \{2, 4, 6, 8\}$ is an abelian group w.r.t. multiplication modulo 10.
- 26) If $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$ find $(\vec{a} + 2\vec{b}) \cdot (2\vec{a} - \vec{b})$.
- 27) Show that the points A(1,2,3), B (2, 3, 1) and C (3,1,2) are vertices of an equilateral triangle.
- 28) If the vectors $4\hat{i} + 11\hat{j} + m\hat{k}$, $7\hat{i} + 2\hat{j} + 6\hat{k}$ and $\hat{i} + 5\hat{j} + 4\hat{k}$ are coplanar, then find 'm'.

SECTION – D

IV. Answer **any four** of the following. **(4×5 =20)**

- 29) Prove that the points (6, 4), (7, - 2), (5, 1), (4, 7) form vertices of a parallelogram.
 - 30) The three vertices of a parallelogram taken in order are (8,5), (-7, -5) and (-5, 5). Find the co-ordinate of the fourth vertex.
 - 31) Find the equation of the locus of a point which moves such that its distance from X-axis is twice its distance from Y-axis.
 - 32) Derive the equation of the straight line whose x -intercept is 'a' and y-intercept is 'b'.
 - 33) Find 'K' for which the lines $2x - ky + 1 = 0$ and $x + (k+1) y - 1 = 0$ are perpendicular.
 - 34) Find the equation of straight line which is passing through intersection of the lines $2x - 3y - 4 = 0$ and $2x + 2y - 1 = 0$ and perpendicular to the line $x + 4y - 8 = 0$.
-