



I Semester B.C.A. Degree Examination, March/April 2022
(Y2K14) (CBCS) (Repeaters)

COMPUTER SCIENCE

BCA 105 T : Discrete Mathematics

Time : 3 Hours

Max. Marks : 100

Instruction : Answer all Sections.

SECTION – A

I. Answer any ten of the following. Each question carries 2 marks. (10×2=20)

- 1) If $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 7, 8\}$ find $B - A$ and $A - B$.
- 2) If $A = \{2, 3, 4, 5\}$ and $B = \{0, 1, 2, 3\}$ find $A \cap B$.
- 3) Define Tautology.
- 4) Find x, y, z if $\begin{bmatrix} 4-y & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} -6 & z+2 \\ 8 & 5 \end{bmatrix}$.
- 5) Construct truth table for proposition $p \vee \sim q$.
- 6) Find the characteristics equation of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$.
- 7) Find the value of 5P_2 .
- 8) If $\log x_7 + \log x_7^2 + \log x_7^3 = 6$ find x .
- 9) Define abelian group.
- 10) If $\vec{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}$, $\vec{b} = 3\hat{i} - 4\hat{j} - 5\hat{k}$ find $|\vec{a} + \vec{b}|$.
- 11) Find the distance between the point $A = (-9, 6)$ and $B = (-7, -3)$.
- 12) Find the equation of the line with slope 2 and cutting off an intercept 3 on y-axis.



SECTION – B

II. Answer **any six** of the following. **Each** question carries **5** marks. **(6×5=30)**

13) Prove that $(p \wedge q) \wedge \sim(p \vee q)$ is contradiction.

14) Prove that $\sim(p \leftrightarrow q) \equiv \sim[(p \rightarrow q) \wedge (q \rightarrow p)]$.

15) If $A = \{1, 4\}$, $B = \{2, 3, 6\}$, $C = \{2, 3, 7\}$ then verify that $A \times (B - C) = (A \times B) - (A \times C)$.

16) Write the inverse, converse and contra-positive of the given conditional "if two angles are right angles, then they are congruent".

17) If $R \rightarrow R$ is defined by $f(x) = 2x + 5$ prove that 'f' is one to one and onto.

18) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and also find inverse.

19) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ find $A^2 - 7A - 2I$.

20) Solve the equation $5x + 2y = 4$, $7x + 3y = 5$ using matrix method.

SECTION – C

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

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

22) Find 'r' if ${}^{15}P_{n-1} : {}^{16}P_{r-2} = 3 : 4$.

23) Find the number of ways in which 8 boys and 5 girls can be arranged in a row so that no two girls are together.

24) Prove that the set $G = \{1, -1, i, -i\}$ from an abelian group under multiplication.

25) Show that the set of all cubeth roots of unity from a group under multiplication.



- 26) If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ find $\vec{a} \times \vec{b}$ verify that \vec{a} and $(\vec{a} \times \vec{b})$ are perpendicular to each other.
- 27) Prove that $\vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) = 0$.
- 28) If vector $2\hat{i} - 3\hat{j} + m\hat{k}$, $2\hat{i} + \hat{j} - \hat{k}$ and $6\hat{i} - \hat{j} + 2\hat{k}$ are coplanar. Find m.

SECTION - D

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

- 29) Show that the points (3, 2) (0, 5) (-3, 2) and (0, -1) are vertices of a square.
- 30) Find the ratio in which the x-axis divides the line segment joining the points (7, -3) and (5, 2).
- 31) Find the equation of the straight line which passes through the point of intersection of the lines $3x + y - 10 = 0$ and $x + 7y - 10 = 0$ and parallel to the line $4x - 3y + 1 = 0$.
- 32) Find the equation of the locus of the point which moves such that it is equidistant from the points (1, 2) and (-2, 3).
- 33) Find the value of K if the lines
- i) $3x + 2y + 1 = 0$ and $Kx + 2y - 1 = 0$ are parallel.
 - ii) $5x - 4y + 8 = 0$ and $4x + Ky + 3 = 0$ are perpendicular.
- 34) Prove that the points (2, 2) and (-3, 3) are equidistant from the line $x + 3y - 7 = 0$ and are on either side of the line.