



CS – 492

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I Semester B.C.A. Degree Examination, March 2023
(Y2K14) (CBCS) (R)
COMPUTER SCIENCE
BCA 105T : Discrete Mathematics

Time : 3 Hours

Instruction : Answer all Sections.

SECTION – A



Max. Marks : 100

I. Answer **any ten** of the following.

(10×2=20)

- 1) If $A = \{a, b\}$, $B = \{c, d, e\}$ find $A \times B$.
- 2) Define an equivalence relation on a set.
- 3) Define scalar matrix with an example.
- 4) Define Tautology.
- 5) If $A = \begin{bmatrix} 2 & -1 \\ 4 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 5 & 2 \\ -3 & 2 \end{bmatrix}$ find $3A - 2B$.
- 6) If $\log_2 64 = x$, then find x .
- 7) Define permutation and combination.
- 8) Define group.
- 9) Define onto function.
- 10) If $\vec{a} = 2\hat{i} + \hat{j} - 3\hat{k}$ and $\vec{b} = 5\hat{i} + \hat{j} + 4\hat{k}$, find $|\vec{a} + \vec{b}|$.
- 11) Find the distance between the points $A(3, -1)$ and $B(4, -2)$.
- 12) Find the slope of the line $3x - 2y + 5 = 0$.

SECTION – B

II. Answer **any six** of the following.

(6×5=30)

- 13) If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5\}$ and $C = \{3, 5, 6, 7\}$, then verify
 $A \times (B \cup C) = \{A \times B\} \cup \{A \times C\}$.
- 14) If $F : \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = 2x + 3$. Prove that 'f' is one-one and onto and hence find inverse of 'f'.

P.T.O.



15) Show that $\sim(p \rightarrow q) \leftrightarrow p \wedge \sim q$ is a tautology.

16) Prove that $\sim(p \vee q) \equiv \sim p \wedge \sim q$.

17) Find the inverse of $A = \begin{bmatrix} 3 & -1 & 2 \\ 2 & 1 & -1 \\ 1 & 3 & -5 \end{bmatrix}$.

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

19) Solve by Cramer's rule $3x - y = 13$, $x + 3y = -8$.

20) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$.

SECTION – C

III. Answer **any six** of the following.

(6×5=30)

21) If $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$, then prove that $a^2 + b^2 = 7ab$.

22) In how many ways the letter of the word "EVALUATE" be arranged so that all vowels are together ?

23) Prove that the set $G = \{2, 4, 6, 8\}$ is an abelian group under multiplication modulo 10.

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

25) If ${}^{2n}C_3 : {}^nC_2 = 44 : 3$, find n.

26) Find the value of ' λ ' for which the vectors $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + \lambda\hat{j} - 3\hat{k}$ are perpendicular to each others.

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 line passing through (1, -2) and parallel to the line $2x + 3y + 4 = 0$.
 - 32) Find the root of the perpendicular drawn from (-3, 5) on the line $x - y - 5 = 0$.
 - 33) Show that the line $x - y + 3 = 0$, $2x - 7y + 1 = 0$, $x - 6y - 2 = 0$ are concurrent.
 - 34) Find 'k' for which the lines $2x - ky + 1 = 0$ and $x + (k + 1)y - 1 = 0$ are perpendicular.
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