15123

Reg. No. | | | | | | | | |

I Semester B.C.A. Degree Examination, March/April - 2023

COMPUTER APPLICATIONS

Discrete Mathematics

(CBCS Scheme)

Time : 3 Hours **Maximum Marks : 100**

Instructions to Candidates:

Answer all Sections.

SECTION - A

I. **Answer any TEN of the following.** **(10×2=20)**

1) Define power set with an example.

2) If A = { 2,3,5} B = {4,5,6} C = {1,2} find A×(B-C).

3) Construct truth table for $\sim p \vee q$.

4) Define scalar matrix with an example.

5) State Caley-Hamilton theorem.

6) If $A=\begin{bmatrix}2 & 1\\ 4 & -2\end{bmatrix}$ $B=\begin{bmatrix}-3 & 2\\ 1 & 4\end{bmatrix}$ then find 2A - 3B.

7) Prove that $(\log_b^a) . (\log_c^b).(\log_a^c)=1$

8) If $^nC_8 = {}^nC_9$ then find $^nC_{17}$.

9) Define Abelian group.

10) If $\vec{a}=2\hat{i}+3\hat{j}+4\hat{k}$ $\vec{b}=\hat{i}+2\hat{j}+2\hat{k}$ then find $|\vec{a}-\vec{b}|$.

11) Find the distance between the points A (-2,3) and B (-4,5).

12) Find the equation of straight line passing through (2,5) and having slope 4.

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SECTION - B

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

13) If A= {a,b, c,d} , B = {c,d,e} C = { c,e,f,g} then verify A×(B-C)= (A×B) - (A×C).

14) If $f : R \rightarrow R$ defined by $f(x) = \mu x - 3$ then prove that f is invertible, also find inverse of f.

15) If $A = \begin{bmatrix} 1 & 2 \\ -3 & 1 \\ 5 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 & -3 \\ -1 & 4 & 2 \end{bmatrix}$ then prove that $(AB)^1 = B^1 \ A^1$.

16) Solve the following system of equations using Cramer's rule

$$3x + y + z = 3$$
$$2x + 2y + 5z = -1$$
$$x - 3y - 4z = 2$$

17) Verify Caley-Hamilton theorem for the Matrix $A = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}$ also find A^{-1}.

18) Prove that $(P \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a Tautology.

19) Prove that $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$.

20) Write the converse, Inverse and contrapositive of " If two integers are equal then their squares are equal".

SECTION - C

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

21) If $a^3+b^3=ab(8-3a-3b)$, then show that $\log\left(\frac{a+b}{2}\right) = \frac{1}{3}(\log a + \log b)$.

22) In how many ways can the letters of the word "ASSASSINATION" be arranged so that all S's are not together.

23) A Examination question paper consists of 12 questions divided into part A and Part B consists of 7 questions and 5 questions respectively. A student is required to attempt 8 questions, selecting atleast 3 from each part. In how many ways can a student select the questions.

24) Prove that G = { 0, 1, 2, 3, 4,5} is an abelian group under addition modulo 6.

25) Show that the set of all fourth roots of unity form a group under multiplication.

26) If $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$ $\vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$ then find $(\vec{a} + 2\vec{b})(2\vec{a} - \vec{b})$.

27) Show that the points A (1,2,3) B (2,3,1) and C (3,1,2) are the 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 (4,-4), (8,2), (14,-2) and (10,-8) are the vertices of square.

30) The three vertices of a parallelogram taken in order are (8,5), (-7, -5), (-5,5). Find the coordinates of the fourth vertex.

31) Find the equation of locus of point which moves such that it is equidistant from the points (1,2) and (2,-3).

32) Derive the equation of the line whose X- intercept is 'a' and Y-intercept is 'b'.

33) If the line 2x - 5y +1 = 0 is perpendicular to (p+1)x+(2p+3)y+3=0 then find p.

34) Find the equation of line passing through the point of intersection of 2x + 3y - 1 = 0 and 3x + 4y - 6 = 0 and parallel to the line 5x - y = 0.