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I Semester B.C.A. Degree Examination, August - 2021

COMPUTER SCIENCE

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. Each question carries 2 marks. (10×2=20)

- 1) If $A = \{2, 3, 4, 5\}$ and $B = \{0, 1, 2, 3\}$ find $A \cap B$.
- 2) Define an Equivalence Relation?
- 3) Construct truth table for $\sim p \rightarrow q$.
- 4) Define a Scalar Matrix with an example.
- 5) If $A = \begin{bmatrix} 3 & 2 \\ -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ -2 & 4 \end{bmatrix}$ find $2A + 3B$.
- 6) State Caley - Hamilton Theorem.
- 7) If $\log_2 64 = x$, then find x .
- 8) Find 'n' if $n_{c_3} = n_{c_5}$.
- 9) Define a group.
- 10) If $\vec{a} = 2i + 3j - 4k$, $\vec{b} = 3i - 4j - 5k$ find $|\vec{a} + \vec{b}|$.
- 11) Find the distance between the points $A(2, -3)$ and $B(4, 5)$.
- 12) Find the equation of the line whose y - intercept is -2 and slope is $\frac{3}{2}$.

[P.T.O.]



SECTION - B

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

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

14) Show that $f : R \rightarrow R$ is defined by $f(x) = 4x + 5$ is both one - one and onto.

15) Prove that $[p \wedge (q \vee r)] \leftrightarrow [(p \wedge q) \vee (p \wedge r)]$ is a tautology.

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

17) Write the Converse, Inverse and Contrapositive of "If two integers are equal then their squares are equal".

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

19) Solve the equations by using Cramer's rule $3x - y + 2z = 13$, $2x + y - z = 3$; $x + 3y - 5z = -8$.

20) Verify the Caley - Hamilton Theorem for the matrix $A = \begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix}$.

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) In how many ways the letters of the word "EVALUATE" be arranged so that all vowels are together.

23) If ${}^{2n}P_3 : {}^n P_3 = 11:1$ find 'n'.

24) Show that the set of all cubeth roots of unity form a group under multiplication.

25) Show that $H = \{0, 2, 4\}$ is a subgroup of the group $(G, +_6)$ where $G = \{0, 1, 2, 3, 4, 5\}$.

26) If $\vec{a} = 2i + j + 4k$, $\vec{b} = 3i - j + 2k$ and $\vec{c} = 3i + j + 4k$ find $\vec{a} \cdot (\vec{b} \times \vec{c})$.



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- 27) Using vector method find the area of the triangle whose vertices are $A(1,2,3)$, $B(2,5,1)$ and $C(-1,1,2)$.
- 28) Find the value of m if $\vec{a} = mi - 3j + 4k$, $\vec{b} = i + 3j + k$ and $\vec{c} = 2i + j + k$ are coplanar.

SECTION - D

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

- 29) Prove that the points $(4, -4)$, $(8, 2)$, $(14, -2)$ and $(10, -8)$ are the 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 locus of point which moves such that it is equidistant from the points $(1, 2)$ and $(-2, 3)$.
- 32) Find the equation of the perpendicular bisector of the line joining the points $A(3, -2)$ and $B(4, 1)$.
- 33) Find the value of k if the lines
- $3x + 2y + 1 = 0$ and $kx + 2y - 1 = 0$ are parallel.
 - $5x - 4y + 8 = 0$ and $4x + ky + 3 = 0$ are perpendicular.
- 34) 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 $4x - 3y + 1 = 0$.
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