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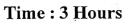
I Semester B.C.A. Degree Examination, April - 2022

COMPUTER SCIENCE

Discrete Mathematics

Paper: 105T

(CBCS Scheme)



Instructions to Candidates:

Answer all sections.



SECTION-A

I. Answer any ten of the following. Each question carries 2 marks.

 $(10 \times 2 = 20)$

- 1. If $A = \{2,3,4,5\}$ and $B = \{0,1,2,3\}$, find $A \cap B$.
- 2. Define Universal set. Give an example.
- 3. Define Tautology.
- 4. Define a scalar matrix with an example.

5. If
$$A = \begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix}$$
 and $B = \begin{bmatrix} 4 & 3 \\ -2 & 1 \end{bmatrix}$, find 2A+3B.

- 6. State Caley Hamilton Theorem.
- 7. If $\log_7^x + \log_7^{x^2} + \log_7^{x^3} = 6$, find 'x'.
- 8. Define a group.
- 9. Define permutation and combination.

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

- 11. Find the distance between the points A(2,-3) and B(4,5).
- 12. Define slope of a line.

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SECTION-B

II. Answer any six of the following. Each question carries 5 marks.

 $(6 \times 5 = 30)$

- 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 $f: R \to R$ is defined by f(x) = 4x + 5 is both one one and onto.
- 15. Show that the proposition $(p \land q) \land \neg (p \lor q)$ is a contradiction.
- 16. Write the converse, inverse and contrapositive of the conditional "If two integers are equal then their squares are equal".
- 17. Find the inverse of the matrix $\begin{bmatrix} 2 & -1 & 3 \\ -1 & 4 & 2 \\ 0 & -3 & 1 \end{bmatrix}$.
- 18. Solve using Cramer's rule 3x y + 2z = 13; 2x + y z = 3; x + 3y 5z = -8.
- 19. Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 4 & 1 \\ -1 & 2 \end{bmatrix}$.
- 20. Verify Caley Hamilton Theorem of 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.

 $(6 \times 5 = 30)$

- 21. If $a^3 + b^3 = ab(8 3a 3b)$, Show that $Log\left(\frac{a + b}{2}\right) = \frac{1}{3}(\log a + \log b)$.
- 22. How many three digit numbers can be formed from the digits 1,2,3,4 and 5 assuming that repetition of digit is not allowed.
- 23. If ${}^{2n}C_3 : {}^{n}C_3 = 11:1$, Find n.
- 24. Show that the set of all cube roots of unity form a group under multiplication.
- 25. Show that $H = \{0,2,4\}$ is subgroup of the group $(G, +_{\sigma})$, 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 $\vec{a} \cdot (\vec{b} \times \vec{c})$.



- 27. Find the area of the triangle whose vertices are A(3,2,1), B(4,-1,2) and C(-1,3,2) using vector method.
- 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. $(4\times5=20)$
 - 29. Show that the points (2,-1), (3,4), (-2,3) and (-3,-2) form a rhombus.
 - 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 perpendicular bisector of the line joining the points A(3,-2) and B(4,1).
 - 32. Find the value of 'K' such that the line (k-2)x+(k+3)y-5=0 is perpendicular to the line 2x-y+7=0.
 - 33. Find the acute angle between the lines $x \sqrt{3}y + 5 = 0$ and $x\sqrt{3} + y 7 = 0$.
 - 34. Find the equation of the straight line which passes through the point of inter section of the line 3x+y-10=0 and x+7y-10=0 and parallel to the line 4x-3y+1=0.

