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

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

COMPUTER SCIENCE

Discrete Mathematics

Paper : 105T

(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 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. **(6×5=30)**

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

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

15. Show that the proposition $(p \wedge q) \wedge \sim (p \vee q)$ 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. **(6×5=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 $(G, +_6)$, 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 $\vec{a}.(\vec{b} \times \vec{c})$.

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. **(4×5=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 $4x - 3y + 1 = 0$.