No. of Printed Pages : **3**

102981

GN-446

I Semester B.C.A. Examination, December - 2019

(F+R) (CBCS) (2014-15 And Onwards)

COMPUTER SCIENCE

B.C.A. 105T : Discrete Mathematics

Time : 3 Hours Max. Marks : 100

Instruction : *Answer* ***all*** *Sections.*

SECTION - A

I. Answer **any ten** of the following : **10x2=20**

1. If $A=\{x / x^2-5x+6=0\}$ and $B=\{1, 2, 3\}$ and $x \epsilon N$. Find $B-A$.

2. If $A=\{1, 3, 4\}$ and $B=\{2, 3, 5, 6\}$ and $C=\{1, 4\}$. Find $(A \cap B) \times C$.

3. Define Unit Matrix with an example.

4. Construct the truth table for $(p \wedge \sim q)$.

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

6. State Cayley-Hamilton theorem.

7. Prove that $\log_2 16\sqrt{8} = \frac{11}{2}$.

8. Define Combinations.

9. Define Group.

10. If $\vec{a} = 3\hat{i} - 2\hat{j} + 4\hat{k}$, and $\vec{b} = 3\hat{i} - \hat{j} + \hat{k}$ Find $\vec{a} \cdot \vec{b}$.

11. Find the distance between the points A(3, −2) and B(−1, 5).

12. Find the slope of the line $3x-2y+5=0$.

P.T.O.

SECTION - B

II. Answer **any six** of the following : **6x5=30**

13. In a class of 45 students, 29 like to play Cricket and 21 like to play Hockey. Also each student like to play at least one of two games. How many students like to play both Cricket and Hockey ?

14. If $f: R \to R$ is defined by $f_{(x)} = 5x+3$ Prove that f is objective and also find f^{-1}.

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

16. Verify Whether $(p \wedge q) \wedge \sim (p \vee q)$ is a contradiction OR not.

17. Prove that $\sim[p \leftrightarrow q] \equiv \sim[(p \to q) \wedge (q \to p)]$.

18. If $A = \begin{bmatrix} 2 & 4 \\ -1 & 5 \\ 4 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 0 & 3 \end{bmatrix}$ Verify $(AB)' = B'A'$.

19. If $A = \begin{bmatrix} 3 & -1 \\ 4 & 5 \end{bmatrix}$ then find A^{-1} using Cayley - Hamilton theorem.

20. Solve by Cramer's rule, $5x+3y-12=0$, $2x+y=5$.

SECTION - C

III. Answer **any six** of the following : **6x5=30**

21. If $\frac{\log x}{a-b} = \frac{\log y}{b-c} = \frac{\log z}{c-a}$ then prove that $xyz = 1$.

22. If $\frac{n!}{2(n-2)!}$ and $\frac{n!}{4!(n-4)!}$ are in the ratio 2 : 1 find 'n'.

23. Prove that the set $G = \{1, 5, 7, 11\}$ is a group under multiplication Modulo 12.

24. Prove that the set of all square roots of unity is a subgroup of fourth roots of unity under multiplication.

25. Find the volume of the parallelopiped. If $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$, $\vec{b} = \hat{i} + \hat{j} - 4\hat{k}$ and $\vec{c} = 3\hat{i} - \hat{j} + 5\hat{k}$.

26. Using Vector method find the area of the triangle whose vertices are A(3, 2, −1), B(1, −2, 4) and C(4, 3, −2).

27. Prove that the points A(2, −1, 1), B(1, −3, −5) and C(3, −4, −4) are the vertices of a right angled triangle.

28. Find the number of arrangement of the letters of the Word "INDEPENDENCE". In how many of these arrangements.

(a) Do the words start with P.

(b) Do all the vowels always Occur together.

SECTION - D

IV. Answer **any four** of the following : **4x5=20**

29. Prove that the points (4, −4), (8, 2), (14, −2) and (10, −8) are the vertices of a square.

30. If a vertex of triangle is (1, 1) and the mid-points of two sides through this vertex are (−1, 2) and (3, 2) then find the centroid of the triangle.

31. Find the equation of the locus of the point which moves such that its distance from (0, 4) is twice its distance from (0, −4).

32. Find the equation of the straight line passing through (−3, 4) and perpendicular to the line Joining (2, 3) and (4, 5).

33. Show that the lines $\sqrt{3}x + y + 2 = 0$, $\sqrt{3}x - y - 1 = 0$ and $y = 0$ are sides of an equilateral triangle.

34. Find the equation of the straight line joining the point of intersection of the lines $x - 2y + 5 = 0$, $3x + 2y + 7 = 0$ and the point of intersection of the lines. $x - 2y + 9 = 0$, $3x + y - 22 = 0$.

- o 0 o -