SN – 658

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# I Semester B.C.A. Degree Examination, Nov./Dec. 2017
## (2014-15 and Onwards) (F + R) (CBCS)
## BCA – 105 T : DISCRETE MATHEMATICS

Time : 3 Hours Max. Marks : 100

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

### SECTION – A

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

1) If A = {2, 3, 4, 5} and B = {0, 1, 2, 3}, find $A \cap B$.

2) If $A = \{x^2 - 5x + 6 = 0, x \in N\}$ and B = {3, 4, 5}, find $A \times B$.

3) Define contradiction.

4) Define unit matrix with 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) Find the characteristic roots of the matrix $A = \begin{bmatrix} 3 & 0 \\ 2 & 5 \end{bmatrix}$.

7) Prove that $\log_{3a} 2a \cdot \log_{4a^2} 3a = \frac{1}{2}$.

8) If ${}^nC_{30} = {}^nC_5$, find 'n'.

9) Define group.

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

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

12) Write the slope of the line $4x - 3y + 2 = 0$.

P.T.O.

## SECTION – B

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

13) In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket ? How many like tennis ?

14) If $f : R \to R$ is defined by $f(x) = 4x + 5$ prove that f is one-one and onto.

15) Prove that $(p \to q) \leftrightarrow (\sim q \to \sim p)$ is a tautology.

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

17) Write the converse, inverse and contrapositive of "If two triangles are congruent, then they are similar".

18) If $A = \begin{bmatrix} 3 \\ 2 \\ 3 \end{bmatrix}$ $B = [2\ 3\ 5]$ prove that $(AB)' = B'A'$.

19) If $A = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$, then find $A^{-1}$ using Cayley-Hamilton theorem.

20) Solve $5x + 2y = 4$, $7x + 3y = 5$ using Cramer's rule.

## SECTION – C

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

21) If $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$, then prove that $a^2 + b^2 = 7ab$.

22) Prove that the set $G = \{1, -1, i, -i\}$ is a group under multiplication.

23) Prove that $H = \{0, 2, 4\}$ is a subgroup of $G = \{0, 1, 2, 3, 4, 5\}$ under addition Modulo 6.

24) How many different words can be formed with the letters of the word "MISSISSIPPI" ? In how many of these four I's do not come together ?

25) If ${}^{2n}C_3 : {}^{n}C_2 = 44 : 3$ find n.

26) If $\vec{a} = 2\hat{i} + \hat{j} + 4\hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} + 4\hat{k}$ 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 $\vec{a} = m\hat{i} - 3\hat{j} + 4\hat{k}$ $\vec{b} = \hat{i} + 3\hat{j} + \hat{k}$ and $\vec{c} = 2\hat{i} + \hat{j} + \hat{k}$ are coplanar.

## SECTION – D

IV. Answer **any four** of the following : **(4×5=20)**

29) Prove that the points $A(3, -4)$, $B(4, 2)$, $C(5, -4)$ and $D(4, -10)$ form vertices of a rhombus.

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

31) Find the acute angle between the lines $2x - y + 13 = 0$ and $2x - 6y + 7 = 0$.

32) The angle between two lines is $\frac{\pi}{4}$ and the slope of one line is $\frac{1}{2}$. Find the slope of the other line.

33) Find the point of intersection of the straight lines $3x - 4y - 1 = 0$ and $5x - 7y - 1 = 0$.

34) Prove that the point $(-1, 3)$ is equidistant from the lines $x + y - 3 = 0$ and $7x - y + 5 = 0$.