

I Semester B.C.A. Degree Examination, November/December 2015  
(CBCS) (Y2K14 Scheme)

BCA – 105 T : DISCRETE MATHEMATICS

Time : 3 Hours

Max. Marks : 100

**Instruction :** Answer all Sections.

SECTION – A

I. Answer any ten :

(10×2=20)

1) If  $A = \{2, 3, 4, 8\}$ ,  $B = \{1, 3, 4\}$  and  $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ .

Verify  $A - B = A \cap \bar{B}$ .

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

3) Define Tautology.

4) Define diagonal matrix.

5) If  $2Y + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ , find Y.

6) State Cayley Hamilton theorem.

7) If  $\log_7 x + \log_7 x^2 + \log_7 x^3 = 6$ , find x.

8) Define combination.

9) Define Abelian group.

10) If  $\vec{a} = 2i + 3j - 4k$ ,  $\vec{b} = 3i - 4j - 5k$  find  $|\vec{a} + \vec{b}|$ .

11) Find the distance between the point,  $A = (-7, 4)$  and  $B = (-5, -1)$ .

12) Find the equation of the line with slope 2 and cutting off an intercept 3 on Y-axis.



## SECTION - B

II. Answer **any six** of the following :

(6×5=30)

13) If  $A = \{a, b, c, d\}$ ,  $B = \{c, d\}$  and  $C = \{d, e\}$  find  $A - B$ ,  $(A - B) \cap (B - C)$ ,  $B \times C$ .

14) If  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 2x + 5$ , prove that  $f$  is one-one and onto.

15) Prove that  $(p \wedge q) \wedge \sim (p \vee q)$  is a contradiction.

16) Write the converse, inverse and contra positive of

"If I work hard then I get a grade".

17) Find the truth values of the propositions  $p$ ,  $q$  and  $r$ , if the compound proposition  $(p \rightarrow \sim q) \rightarrow r$  is false.

18) If  $2A + B = \begin{bmatrix} 4 & 4 & 7 \\ 7 & 3 & 4 \end{bmatrix}$ ,  $A - 2B = \begin{bmatrix} -3 & 2 & 1 \\ 1 & -1 & 2 \end{bmatrix}$  then find  $A$  and  $B$ .

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

20) Solve the equations  $5x + 2y = 4$ ,  $7x + 3y = 5$  using Matrix method.

## SECTION - C

III. Answer **any six** of the following :

(6×5=30)

21) If  $\log\left(\frac{a+b}{2}\right) = \frac{1}{2}(\log a + \log b)$ , show that  $a = b$ .

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

23) If  ${}^{15}C_{r+3} = {}^{15}C_{2r-3}$ , find  $r$ .

24) If  $G = \{3^n : n \in \mathbb{Z}\}$ , prove that  $G$  is an abelian group under multiplication.

25) Prove that  $G = \{1, 5, 7, 11\}$  is a group under multiplication modulo 12.

26) Find the value of  $\lambda$  for which the vectors  $\vec{a} = 3i + j - 2k$  and  $\vec{b} = i + \lambda j - 3k$  are perpendicular to each other.

27) Find the area of the triangle whose vertices are  $A(1, 2, 3)$ ,  $B(2, 5, 1)$  and  $C(-1, 1, 2)$  using vector method.

28) If the vectors  $2i - 3j + mk$ ,  $2i + j - k$  and  $6i - j + 2k$  are coplanar, find  $m$ .



SECTION - D

IV. Answer **any four** of the following :

(4×5=20)

29) Show that the points (3, 2), (0, 5), (-3, 2) and (0, -1) 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 a point which moves such that the sum of the squares of the distance from (a, 0) and (-a, 0) is  $2C^2$ .

32) Find the equation of the line whose x-intercept is 'a' and y-intercept is b.

33) If the line  $2x - 5y + 1 = 0$  is perpendicular to  $(p + 1)x + (2p + 3)y + 3 = 0$ , find p.

34) Find the equation of the line passing through the point of intersection of  $2x + 3y - 1 = 0$  and  $3x + 4y - 6 = 0$  and parallel to the line  $5x - y = 0$ .

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