

## I Semester B.C.A. Degree Examination, November/December 2016 (CBCS) (F+R)

(2014-15 & Onwards) BCA - 105 : DISCRETE MATHEMATICS

Time: 3 Hours

Max. Marks: 100

Instruction : Answer all Sections.

SECTION - A

Answer any ten :

(10×2=20)

- 1) If  $A = \{x | x \in \mathbb{N} \text{ and } x < 3\}$  and  $B = \{0, 1, 3\}$ . Find A B.
- 2) If  $A = \{1, 2, 3\}$ ,  $B = \{3, 4, 5\}$  and  $C = \{0, 2, 3\}$ , find  $(A \cap B) \times C$ .
- 3) Construct truth table for the proposition p v ~q.

4) Find x, y, z if 
$$\begin{bmatrix} 4-y & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} -1 & z+1 \\ 1 & 5 \end{bmatrix}$$
.



- 5) If  $A = \begin{bmatrix} 1 & -2 \\ -1 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 0 & 3 \\ 3 & 1 & 4 \end{bmatrix}$ , find AB.
- 6) Find the characteristic equation of the matrix  $\begin{bmatrix} 1 & -2 \\ 3 & 0 \end{bmatrix}$ .
- 7) Prove that log<sub>b</sub>a.log<sub>c</sub>b. log<sub>a</sub>c=1.
- 8) Find n if 2 ( ${}^{n}P_{3}$ ) =  ${}^{n}P_{5}$ .
- 9) On the set of integers Z, the binary operation is defined by

$$a^*b = \frac{ab}{3}$$
,  $\forall a, b \in Z$ . Find identity element.

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



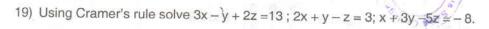
- 11) Find the midpoint of line joining (-2, 8) and (1, -2).
- 12) Find the equation of the line passing through (-1, 2) and having slope 3.

SECTION-B

II. Answer any six of the following:

 $(6 \times 5 = 30)$ 

- 13) If  $A = \{1, 4\}$ ,  $B = \{2, 3, 6\}$ ,  $C = \{2, 3, 7\}$  then verify that  $A \times (B C) = (A \times B) (A \times C)$ .
- 14) Show that the function  $f: R \rightarrow R$  defined by f(x) = 4x + 3 is invertible. Find the inverse of f.
- 15) Show that  $p \lor (q \land r) \leftrightarrow [(p \lor q) \land (p \lor r)]$  is a tautology.
  - 16) If  $(p \rightarrow q) \land (p \land r)$  is given to be false, find the truth values of p, q, r.
  - 17) Write the truth table of  $(p \lor q) \lor \sim p$ . Show that the compound propositions  $p \land q$  and  $\sim (p \to \sim q)$  are logically equivalent.
  - 18) Find the inverse of the matrix  $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ .



20) Verify Cayley Hamilton theorem for the matrix  $\begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$ 

SECTION - C

III. Answer any six of the following.

 $(6 \times 5 = 30)$ 

21) If 
$$\log \left(\frac{a-b}{5}\right) = \frac{1}{2}(\log a + \log b)$$
, show that  $a^2 + b^2 = 27$  ab.

- 22) Find the number of three digit even numbers that can be formed using 2, 3, 4, 5, 6 repetitions being not allowed.
- 23) If  $^{n+2}C_8$ :  $^{n-2}P_4 = 57$ : 16 find n.



- 24) Prove that the set  $G = \{3n \mid n \in \mathbb{Z}\}$  is an abelian group w.r.t. addition.
- 25) Prove that the set G = {2, 4, 6, 8} is an abelian group w.r.t. multiplication modulo 10.
- 26) If  $\vec{a} = \hat{i} \hat{j} + 2\hat{k}$ ,  $\vec{b} = 2\hat{i} + 3\hat{j} \hat{k}$  find  $(\vec{a} + 2\vec{b}) \cdot (2\vec{a} \vec{b})$ .
- 27) Show that the points A(1,2,3), B(2, 3, 1) and C(3,1,2) are vertices of an equilateral triangle.
- 28) If the vectors  $4\hat{i} + 11\hat{j} + m\hat{k}$ ,  $7\hat{i} + 2\hat{j} + 6\hat{k}$  and  $\hat{i} + 5\hat{j} + 4\hat{k}$  are coplanar, then find 'm'.

## SECTION - D

## IV. Answer any four of the following.

 $(4 \times 5 = 20)$ 

- 29) Prove that the points (6, 4), (7, -2), (5, 1), (4, 7) form vertices of a parallelogram.
- 30) The three vertices of a parallelogram taken in order are (8,5), (-7,-5) and (-5,5). Find the co-ordinate of the fourth vertex.
- 31) Find the equation of the locus of a point which moves such that its distance from X-axis is twice its distance from Y-axis.
- 32) Derive the equation of the straight line whose x -intercept is 'a' and y-intercept is 'b'.
- 33) Find 'K' for which the lines 2x ky + 1 = 0 and x + (k+1) y 1 = 0 are perpendicular.
- 34) Find the equation of straight line which is passing through intersection of the lines 2x 3y 4 = 0 and 2x + 2y 1 = 0 and perpendicular to the line x + 4y 8 = 0.

