



# I Semester B.C.A. Examination, April/May 2021 (CBCS) (F+R) (Y2K14 Scheme) COMPUTER SCIENCE

**BCA105T: Discrete Mathematics** 

Time: 3 Hours

Max. Marks: 100

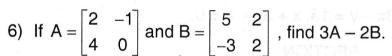
Instruction: Answer all questions.

### SECTION - A

I. Answer any ten of the following.

 $(10 \times 2 = 20)$ 

- 1) Find x and y if (x + 3, 7) = (4, 2x y).
- 2) If  $A = \{0, -2, 4\}$  and  $B = \{x/x^3 1 = 0 \text{ and } x \text{ is real}\}$ , then find  $A \times B$ .
- 3) Define an equivalence relation on a set.
- 4) Write the negation of  $p \rightarrow q$ .
- 5) Find the adjoint of  $\begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ .





- 7) Find 'x' if  $\log_{32} 256 = x$ .
- 8) Find 'n' if  ${}^{n}C_{8} = {}^{n}C_{2}$ .
- 9) Show that  $\star$  is not a binary operation on the set z of integers defined by  $a \star b = a^b$ ,  $\forall a, b \in z$ .

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

- 11) Find the mid point of the line joining (3, 1) and (-2, 5).
- 12) Find x intercept and y intercept of the line x 3y + 9 = 0.

v ways can the lotters of the word "PENOIL" be arranged so

# SECTION - B

II. Answer any six of the following.

 $(6 \times 5 = 30)$ 

- 13) Find the number of ways 5 English, 4 Kannada and 6 Commerce books be arranged in a shelf such that (i) books of the same subjects are always together (ii) no two books of the same subject are together.
- 14) If  $f: R \to R$  is defined by f(x) = 2x + 3, prove that 'f' is bijective and hence find  $f^{-1}$ .
- 15) Show that  $\sim (p \rightarrow q) \leftrightarrow p \land \sim q$  is a tautology.
- 16) Show that  $(p \rightarrow q) \equiv (\sim p \lor q) \land (\sim q \lor p)$ .
- 17) If the truth value of  $(p \to q) \land (p \lor r)$  is given to be false, find the truth values of p, q, r.
- 18) Find the inverse of  $\begin{bmatrix} 3 & -1 & 2 \\ 2 & 1 & -1 \\ 1 & 3 & -5 \end{bmatrix}$
- 19) Verify Cayley-Hemilton theorem for the matrix  $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ .
- 20) Solve by Cramer's rule 3x y = 13, x + 3y + 8 = 0.

SECTION - C

III. Answer any six of the following.

 $(6 \times 5 = 30)$ 

- 21) If  $a^2 + b^2 = 23ab$ , prove that  $log\left(\frac{a+b}{5}\right) = \frac{1}{2}(log a + log b)$ .
- 22) If  $(2n + 1) P_{n-1}$ :  $(2n 1)P_n = 3$ : 5, find 'n'.
- 23) Prove that the set of all positive rationals Q<sup>+</sup> is a non-abelian group w.r.t. \* defined by  $a * b = \frac{2a}{b}$ ,  $\forall a, b \in Q^+$ .
- 24) Prove that the set {0, 2, 4} is a subgroup of integer modulo6 w.r.t. addition.
- 25) Find the area of parallelogram whose diagonals are given by the vectors  $3\hat{i} + \hat{j} 2\hat{k}$  and  $\hat{i} 2\hat{j} + \hat{k}$ .
- 26) Find  $\mu$ , if the vectors are  $\overrightarrow{a}=(\mu,1,-2), \overrightarrow{b}=(2,1,1)$  and  $\overrightarrow{c}=(1,-1,3)$  are coplanar.
- 27) Find the equation of perpendicular bisector of the line joining (3, -2) and (4, 1).
- 28) In how many ways can the letters of the word "PENCIL" be arranged so that (i) N is always next to E (ii) N and E are always together.



## SECTION - D

# IV. Answer any four of the following.

 $(4 \times 5 = 20)$ 

- 29) Show that the points (5, 1), (1, -7), (9, -3) and (13, 5) form a rhombus.
- 30) Find the value of 'k' such that the area of triangle formed by (k 1, 2), (-1, 3), (2, -4) is 32 sq. units.
- 31) Find the equation of straight line passing through (1, -2) and parallel to the line 2x + 3y + 4 = 0.
- 32) Find foot of the perpendicular drawn from (-3, 5) on the line x y 5 = 0.
- 33) Show that the lines x y + 3 = 0, 2x 7y + 1 = 0, x 6y 2 = 0 are concurrent.
- 34) Find the equation of the line passing through intersection of the lines 3x 4y + 21 = 0 and 15x + 8y + 45 = 0 and through (1, -1).