# I Semester B.C.A. Examination, April/May 2021 <br> (CBCS) (F+R) (Y2K14 Scheme) <br> COMPUTER SCIENCE <br> BCA105T : Discrete Mathematics 

Time : 3 Hours
Max. Marks : 100
Instruction : Answer all questions.
SECTION - A
I. Answer any ten of the following.

1) Find $x$ and $y$ if $(x+3,7)=(4,2 x-y)$.
2) If $A=\{0,-2,4\}$ and $B=\left\{x / x^{3}-1=0\right.$ and $x$ 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 $\left[\begin{array}{cc}2 & -1 \\ 3 & 2\end{array}\right]$.
6) If $A=\left[\begin{array}{cc}2 & -1 \\ 4 & 0\end{array}\right]$ and $B=\left[\begin{array}{cc}5 & 2 \\ -3 & 2\end{array}\right]$, find $3 A-2 B$.

7) Find ' $x$ ' if $\log _{32} 256=x$.
8) Find ' $n$ ' if ${ }^{n} \mathrm{C}_{8}={ }^{n} \mathrm{C}_{2}$.
9) Show that $*$ is not a binary operation on the set $z$ of integers defined by $a * b=a^{b}, \forall a, b \in z$.
10) If $\vec{a}=2 \hat{i}+\hat{j}-\hat{k}$ and $\vec{b}=\hat{i}-3 \hat{j}+\hat{k}$, find $|\vec{a}+\vec{b}|$.
11) Find the mid point of the line joining $(3,1)$ and $(-2,5)$.
12) Find $x$ intercept and $y$ intercept of the line $x-3 y+9=0$.

## 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 $f: R \rightarrow R$ is defined by $f(x)=2 x+3$, prove that ' $f$ ' is bijective and hence find $f^{-1}$.
15) Show that $\sim(p \rightarrow q) \leftrightarrow p \wedge \sim q$ is a tautology.
16) Show that $(p \rightarrow q) \equiv(\sim p \vee q) \wedge(\sim q \vee p)$.
17) If the truth value of $(p \rightarrow q) \wedge(p \vee r)$ is given to be false, find the truth values of $p, q, r$.
18) Find the inverse of $\left[\begin{array}{ccc}3 & -1 & 2 \\ 2 & 1 & -1 \\ 1 & 3 & -5\end{array}\right]$.
19) Verify Cayley-Hemilton theorem for the matrix $\left[\begin{array}{cc}3 & 1 \\ -1 & 2\end{array}\right]$.
20) Solve by Cramer's rule $3 x-y=13, x+3 y+8=0$.
SECTION - C
III. Answer any six of the following.
21) If $a^{2}+b^{2}=23 a b$, prove that $\log \left(\frac{a+b}{5}\right)=\frac{1}{2}(\log a+\log b)$.
22) If $(2 n+1) P_{n-1}:(2 n-1) P_{n}=3: 5$, find ' $n$ '.
23) Prove that the set of all positive rationals $Q^{+}$is a non-abelian group w.r.t. * defined by $\mathrm{a} * \mathrm{~b}=\frac{2 \mathrm{a}}{\mathrm{b}}, \forall \mathrm{a}, \mathrm{b} \in \mathrm{Q}^{+}$.
24) Prove that the set $\{0,2,4\}$ is a subgroup of integer modulo 6 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 $\vec{a}=(\mu, 1,-2), \vec{b}=(2,1,1)$ and $\vec{c}=(1,-1,3)$ 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 $2 x+3 y+4=0$.
32) Find foot of the perpendicular drawn from $(-3,5)$ on the line $x-y-5=0$.
33) Show that the lines $x-y+3=0,2 x-7 y+1=0, x-6 y-2=0$ are concurrent.
34) Find the equation of the line passing through intersection of the lines $3 x-4 y+21=0$ and $15 x+8 y+45=0$ and through $(1,-1)$.

