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QP – 452

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

15

Time : 3 Hours

Max. Marks: 100

 $(10 \times 2 = 20)$ 

P.T.O.

Instruction : Answer all questions.

### SECTION – A

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

6) If 
$$A = \begin{bmatrix} 2 & -1 \\ 4 & 0 \end{bmatrix}$$
 and  $B = \begin{bmatrix} 5 & 2 \\ -3 & 2 \end{bmatrix}$ , find  $3A - 2B$ .

- 7) Find 'x' if  $\log_{32} 256 = x$ .
- 8) Find 'n' if  ${}^{n}C_{8} = {}^{n}C_{2}$ .
- Show that \* is not a binary operation on the set z of integers defined by a \* b = a<sup>b</sup>, ∀a, b∈z.

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- 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 3y + 9 = 0.



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#### SECTION - B

- II. Answer any six of the following.
  - 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) = 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  $(p \rightarrow q) \land (p \lor r)$  is given to be false, find the truth values of p, q, r.
  - 18) Find the inverse of  $\begin{vmatrix} 3 & -1 & 2 \\ 2 & 1 & -1 \\ 1 & 3 & -5 \end{vmatrix}$

19) Verify Cayley-Hemilton theorem for the matrix  $\begin{vmatrix} 3 & 1 \\ -1 & 2 \end{vmatrix}$ .

20) Solve by Cramer's rule 3x - y = 13, x + 3y + 8 = 0.

- III. Answer any six of the following.
  - 21) If  $a^2 + b^2 = 23ab$ , prove that  $log\left(\frac{a+b}{5}\right) = \frac{1}{2}(loga + logb)$ .
  - 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.

(6×5=30)

 $(6 \times 5 = 30)$ 

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# SECTION - D

-3-

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

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).

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#### (4×5=20)