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I Semester B.C.A. Degree Examination, August - 2021

COMPUTER SCIENCE

Discrete Mathematics

(CBCS Scheme)

Time : 3 Hours

Maximum Marks : 100

*Instructions to Candidates :*

Answer all Sections.

## SECTION - A

I. Answer any **TEN** of the following. Each question carries 2 marks. (10×2=20)

1) If  $A = \{2, 3, 4, 5\}$  and  $B = \{0, 1, 2, 3\}$  find  $A \cap B$ .

2) Define an Equivalence Relation?

3) Construct truth table for  $\sim p \rightarrow q$ .

4) Define a Scalar Matrix with an example.

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

6) State Caley - Hamilton Theorem.

7) If  $\log_2 64 = x$ , then find  $x$ .8) Find 'n' if  $n_{c_{30}} = n_{c_5}$ .

9) Define a group.

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

11) Find the distance between the points  $A(2, -3)$  and  $B(4, 5)$ .12) Find the equation of the line whose y - intercept is -2 and slope is  $\frac{3}{2}$ .

[P.T.O.]





## SECTION - B

II. Answer any **SIX** of the following. Each question carries 5 marks. (6×5=30)

13) If  $A = \{1, 4\}$ ,  $B = \{2, 3, 6\}$  and  $C = \{2, 3, 7\}$  then verify that  $A \times (B - C) = (A \times B) - (A \times C)$ .

14) Show that  $f: R \rightarrow R$  is defined by  $f(x) = 4x + 5$  is both one - one and onto.

15) Prove that  $[p \wedge (q \vee r)] \leftrightarrow [(p \wedge q) \vee (p \wedge r)]$  is a tautology.

16) Prove that  $\sim(p \leftrightarrow q) \equiv \sim[(p \rightarrow q) \wedge (q \rightarrow p)]$ .

17) Write the Converse, Inverse and Contrapositive of "If two integers are equal then their squares are equal".

18) Find the inverse of the matrix  $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ .

19) Solve the equations by using Cramer's rule  $3x - y + 2z = 13$ ,  $2x + y - z = 3$ ;  $x + 3y - 5z = -8$ .

20) Verify the Caley - Hamilton Theorem for the matrix  $A = \begin{bmatrix} 2 & 4 \\ 7 & 3 \end{bmatrix}$ .

## SECTION - C

III. Answer any **SIX** of the following. Each question carries 5 marks. (6×5=30)

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

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

23) If  ${}^{2n}C_3 : {}^nC_3 = 11:1$  find 'n'.

24) Show that the set of all cubeth roots of unity form a group under multiplication.

25) Show that  $H = \{0, 2, 4\}$  is a subgroup of the group  $(G, +_6)$  where  $G = \{0, 1, 2, 3, 4, 5\}$ .

26) If  $\vec{a} = 2i + j + 4k$ ,  $\vec{b} = 3i - j + 2k$  and  $\vec{c} = 3i + j + 4k$  find  $\vec{a} \cdot (\vec{b} \times \vec{c})$ .





- 27) Using vector method find the area of the triangle whose vertices are  $A(1,2,3)$ ,  $B(2,5,1)$  and  $C(-1,1,2)$ .
- 28) Find the value of  $m$  if  $\vec{a} = mi - 3j + 4k$ ,  $\vec{b} = i + 3j + k$  and  $\vec{c} = 2i + j + k$  are coplanar.

### SECTION - D

IV. Answer any **FOUR** of the following. Each question carries 5 marks. (4×5=20)

- 29) Prove that the points  $(4, -4)$ ,  $(8, 2)$ ,  $(14, -2)$  and  $(10, -8)$  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 point which moves such that it is equidistant from the points  $(1, 2)$  and  $(-2, 3)$ .
- 32) Find the equation of the perpendicular bisector of the line joining the points  $A(3, -2)$  and  $B(4, 1)$ .
- 33) Find the value of  $k$  if the lines
- $3x + 2y + 1 = 0$  and  $kx + 2y - 1 = 0$  are parallel.
  - $5x - 4y + 8 = 0$  and  $4x + ky + 3 = 0$  are perpendicular.
- 34) Find the equation of the straight line which passes through the point of intersection of the lines  $3x + y - 10 = 0$  and  $x + 7y - 10 = 0$  and parallel to the line  $4x - 3y + 1 = 0$ .
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