QP – 414

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I Semester B.C.A. Degree Examination, March/April 2022
(Y2K14) (CBCS) (Repeaters)
COMPUTER SCIENCE
BCA 105 T : Discrete Mathematics

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** Sections.*

SECTION – A

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

1) If A = {1, 2, 3, 4} and B = {3, 4, 7, 8} find B – A and A – B.

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

3) Define Tautology.

4) Find x, y, z if $\begin{bmatrix} 4-y & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} -6 & z+2 \\ 8 & 5 \end{bmatrix}$.

5) Construct truth table for proposition $p \vee \sim q$.

6) Find the characteristics equation of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$.

7) Find the value of ${}^5P_2$.

8) If $\log x_7 + \log x_7^2 + \log x_7^3 = 6$ find x.

9) Define abelian group.

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

11) Find the distance between the point A = (–9, 6) and B = (–7, –3).

12) Find the equation of the line with slope 2 and cutting off an intercept 3 on y-axis.

P.T.O.

SECTION – B

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

13) Prove that $(p \wedge q) \wedge \sim (p \vee q)$ is contradiction.

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

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

16) Write the inverse, converse and contra-positive of the given conditional "if two angles are right angles, then they are congruent".

17) If $R \rightarrow R$ is defined by f(x) = 2x + 5 prove that 'f' is one to one and onto.

18) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and also find inverse.

19) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ find $A^2 - 7A - 2I$.

20) Solve the equation 5x + 2y = 4, 7x + 3y = 5 using matrix method.

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) Find 'r' if ${}^{15}P_{n-1} : {}^{16}P_{r-2} = 3 : 4$.

23) Find the number of ways in which 8 boys and 5 girls can be arranged in a row so that no two girls are together.

24) Prove that the set G = {1, –1, i, –i} from an abelian group under multiplication.

25) Show that the set of all cubeth roots of unity from a group under multiplication.

26) If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ find $\vec{a} \times \vec{b}$ verify that $\vec{a}$ and $(\vec{a} \times \vec{b})$ are perpendicular to each other.

27) Prove that $\vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) = 0$.

28) If vector $2\hat{i} - 3\hat{j} + m\hat{k}, 2\hat{i} + \hat{j} - \hat{k}$ and $6\hat{i} - \hat{j} + 2\hat{k}$ are coplanar. Find m.

SECTION – D

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

29) Show that the points (3, 2) (0, 5) (–3, 2) and (0, –1) are 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 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 $4x - 3y + 1 = 0$.

32) Find the equation of the locus of the point which moves such that it is equidistant from the points (1, 2) and (–2, 3).

33) Find the value of K if the lines

i) $3x + 2y + 1 = 0$ and $Kx + 2y - 1 = 0$ are parallel.

ii) $5x - 4y + 8 = 0$ and $4x + Ky + 3 = 0$ are perpendicular.

34) Prove that the points (2, 2) and (–3, 3) are equidistant from the line $x + 3y - 7 = 0$ and are on either side of the line.