SN – 450

I Semester B.C.A. Degree Examination, November/December 2014
(CBCS) (Y2K14 Scheme) (Fresh) (2014-15 and Onwards)
COMPUTER SCIENCE
BCA 105T : Discrete Mathematics

Time : 3 Hours Max. Marks : 100

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

SECTION – A

I. Answer **any ten** of the following : **(10×2=20)**

1) Define a power set. Illustrate with an example.
2) If P = {1, 2} form the P × P × P.
3) Define equivalence relation.
4) Define Scalar Matrix with example.
5) If $A = \begin{pmatrix} 2 & 1 \\ 4 & -2 \end{pmatrix}$, $B = \begin{pmatrix} 4 & 3 \\ 2 & -1 \end{pmatrix}$ find AB.
6) Prove that $3 \log 2 + \log 5 = \log 40$.
7) Define permutation.
8) Define Coplanar vectors.
9) Define slope of a line.
10) Find the equation of the straight line passing through (2, 5) and having slope 4.
11) Find the coordinates of the mid point which divides the join of (4, 3) and (–2, 7).
12) Define order of a group.

SECTION – B

II. Answer **any six** of the following : **(6×5=30)**

13) Verify whether $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a tautology.
14) Prove that $\sim(p \leftrightarrow q) \equiv \sim[(p \rightarrow q) \wedge (q \rightarrow p)]$.
15) Consider $f : R \rightarrow R$ given by $f(x) = 4x + 3$. Show that f is invertible.

P.T.O.

16) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$.

17) Solve using Cramer's rule
$3x + y + z = 3$
$2x + 2y + 5z = -1$
$x - 3y - 4z = 2$

18) Solve the equations $2x + 5y = 1$, $3x + 2y = 7$ using matrix method.

19) Find the eigen values and eigen vectors of $A = \begin{pmatrix} 1 & 4 \\ 3 & 2 \end{pmatrix}$.

20) Let $A = Z^+$, the set of positive integers. $R = \{(a, b) \mid a \leq b\}$. Is R an equivalence relation.

SECTION – C

III. Answer **any six** of the following : **(6×5=30)**

21) If $\log x - 2\log\frac{6}{7} = \frac{1}{2}\log\frac{81}{16} - \log\frac{27}{196}$ find x.

22) a) Find the number of different signals that can be generated by arranging atleast 3 flags in order (one below the other) on a vertical staff, if 6 different flags are available.

b) If $\frac{1}{9!} + \frac{1}{10!} = \frac{x}{11!}$ find x.

23) a) Find r if ${}^{10}P_r = 2^9 p_r$.

b) In how many ways can the letters of the word ASSASSINATION be arranged so that all the S's are together.

24) A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consist of (i) exactly 3 girls (ii) atleast 3 girls (iii) atmost 3 girls.

25) Prove that $G = \{1, 5, 7, 11\}$ is a group under multiplication modulo 12.

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) Using vector method show that the points A (2, –1, 3), B (4, 3, 1) and C (3, 1, 2) are collinear.

SECTION – D

IV. Answer **any four** of the following : **(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 equation of the locus of the point which moves such that its distance from (0, 3) is twice its distance from (0, –3).

31) Show that the line joining the points (2, –3) and (–5, 1) is

a) Parallel to the line joining (7, –1) and (0, 3)

b) Perpendicular to the line joining (4, 5) and (0, –2).

32) 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 $4x - 3y + 1 = 0$.

33) Find the equations of the straight lines passing through the point (4, –2) and making an angle of $\frac{\pi}{4}$ with the line $8x + 7y - 1 = 0$.

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