



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



(10×2=20)

I. Answer **any ten** of the following :

- 1) Define a power set. Illustrate with an example.
- 2) If $P = \{1, 2\}$ form the $P \times P \times P$.
- 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 $f : \mathbb{R} \rightarrow \mathbb{R}$ given by $f(x) = 4x + 3$. Show that f is invertible.

P.T.O.



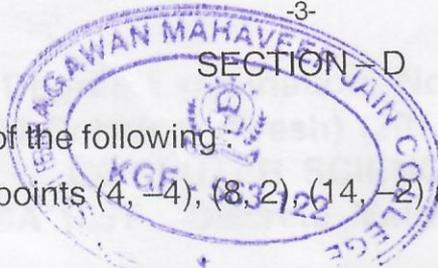
- 16) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$.
- 17) Solve using Cramer's rule
 $3x + y + z = 3$
 $2x + 2y + 5z = -1$
 $x - 3y - 4z = 2$
- 18) Solve the equations $2x + 5y = 1$, $3x + 2y = 7$ using matrix method.
- 19) Find the eigen values and eigen vectors of $A = \begin{pmatrix} 1 & 4 \\ 3 & 2 \end{pmatrix}$.
- 20) Let $A = \mathbb{Z}^+$, 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.
