



560

I Semester B.C.A. Degree Examination, December 2018

(CBCS Scheme)

COMPUTER SCIENCE

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) Write the following sets in set-builder form

a) $\{2, 5, 8, 11, \dots\}$, b) $\{1, 4, 9, \dots, 100\}$

2) Define universal set. Give an example.

3) Let $A = \{1, 2, 3, 4, 6\}$. Let R be the relation defined by $R = \{(a, b) / a \in A, b \in A$
a divides $b\}$.a) Write the elements of R .b) Write the domain of R .

4) Define Tautology.

5) What is upper triangular matrix ? Give an example.

6) Find the value of x .a) $\log_4 64 = x$ b) $\log_x 27 = 3$

7) How many different signals can be made by 6 flags of different colors ?

8) Define a group.

9) If $\vec{a} = 3\vec{i} - 4\vec{j}$, $\vec{b} = 2\vec{i} + \vec{j}$, find $|\vec{a} + \vec{b}|$.10) Find the value of 'a' if the distance between the points $(a, 2)$ and $(3, 4)$ is $\sqrt{8}$ units.11) If the centroid of the triangle ABC is $(2, 3)$ and $A = (4, 2)$ and $B = (4, 5)$. Find the co-ordinates of C .

12) Define slope of a line.

P.T.O.



- 23) A examination question paper consists of 12 questions divided in to part A and Part B. Part A consists of 7 questions and Part B consist of 5 questions. In how many ways can a student answer 8 questions in the examination if
- a) there is no condition put in the paper
 - b) the student has to answer 5 from Part A and 3 from Part B .
- 24) Show that $(Z_6, +_6)$ where $Z_6 = \{ 0, 1, 2, 3, 4, 5\}$ is a group.
- 25) Show that the set of all fourth roots of unity form a group under multiplication.
- 26) Show that the points with position vector $2i - j + k$, $i - 3j - 5k$ and $3i - 4j - 4k$ are the vertices of a right angled triangle. Also find the remaining angles of the triangle.
- 27) Show that the points A (2, 3, -1), B (1, -2, 3), C (3, 4, -2) and D (1, -6, 6) are coplanar.
- 28) Find the area of the parallelogram whose diagonals are $\vec{a} = 3i + j - 2k$ and $\vec{b} = i - 3j + 4k$.

SECTION - D

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

(4×5=20)

- 29) Show that the points (2, -1) (3, 4), (-2, 3) and (-3, -2) form a rhombus.
- 30) Find the area of the quadrilateral whose vertices are (1, -1), (7, -3) (12, 2) and (7, 21).
- 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) Show that the line joining the points (2, 3) and (4, 2) is perpendicular to the line joining the points (5, 3) and (6, 5).
- 33) Find the equation of the line passing through (5, -2) and making an angle 150° with x-axis in the positive direction.
- 34) Find the equation of the line passing through (-2, 6) and sum of the intercepts on the co-ordinate axes is 5.



SECTION - B

II. Answer any six of the following.

(6×5=30)

- 13) If $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ is the universal set. $A = \{2, 3, 4, 8\}$,
 $B = \{1, 3, 4\}$ and $C = \{3, 4, 5, 6\}$ verify

$$(A \cup B)' = A' \cap B' \text{ and } (A \cap B)' = A' \cup B'.$$

- 14) Let $A = \{-2, -1, 0, 1, 2\}$, $B = \{-3, -1, 1, 5\}$. Define $f : A \rightarrow B$ by
 $f(a) = 2a^2 - 3$, for all $a \in A$. Is f one-one? Onto? Find $f^{-1}(5)$ and
 $f^{-1}(-1)$.

- 15) Show that the proposition $(p \wedge q) \wedge \sim (p \vee q)$ is a contradiction.

- 16) Write the converse, inverse and contrapositive of the conditional "If two integers are equal then their squares are equal".

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

- 18) Solve using Cramer's rule $5x + 2y + z = -1$; $x + 7y - 6z = -18$,
 $3y + 6z = 9$.

- 19) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 4 & 1 \\ -1 & 2 \end{bmatrix}$.

- 20) Verify the Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

SECTION - C

III. Answer any six of the following.

(6×5=30)

- 21) If $a^2 + b^2 = 7ab$ S.T.

- a) $2 \log(a + b) = 2 \log 3 + \log a + \log b$
 b) $2 \log(a - b) = \log 5 + \log a + \log b$

- 22) In how many ways 3 boys and 5 girls can be arranged in a row so that

- a) no two boys together?
 b) all girls are together