65123

First Semester B.C.A. Degree Examination, November/December 2019

(CBCS Scheme)

Computer Science

DISCRETE MATHEMATICS

Time : 3 Hours] *[Max. Marks : 100*

Instructions to Candidates : Answer ALL Sections :

SECTION – A

Answer any **TEN** of the following : **(10 × 2 = 20)**

1. Write the following sets in set-builder form

   (a) $\{2, 4, 8, 16, 32, \cdots\}$

   (b) $\{1, 3, 5, 7, 9\}$.

2. Define subset. Give an example.

3. Let $A = \{1, 2, 3, 4, 5\}$, $B = \{1, 4, 5\}$. Let 'R' be a relation from A into B, defined by $R = \{(a, b) / a \in A, b \in B, a < b\}$

   (a) Write the elements of R

   (b) Write the domain of R.

4. Define Tautology.

5. Define unit matrix with example.

6. Find the value of $\begin{vmatrix} 3 & 4 & 2 \\ -1 & 3 & 4 \\ -2 & 3 & 1 \end{vmatrix}$.

7. Find the value of x

   (a) $\log_8^{32} = x$

   (b) $\log_4^{64} = x$.

8. In how many ways 5 children can stand in a queue?

9. Define a group.

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

11. Find the mid point of line joining (-2, 8) and (1, -2).

12. Define slope of a line.

SECTION – B

Answer any **SIX** of the following : **(6 × 5 = 30)**

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

14. Let $A = \{2, 1, 5, 6\}$ and $B = \{5, 2, 26, 37\}$. Define $f : A \to B$ by $f(a) = a^2 + 1$ for all $a \in A$, show that 'f' is both one to one and onto? Define f^{-1}.

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

16. Prove that $[p \wedge (q \vee r)] \equiv [(p \wedge q) \vee (p \wedge q)]$.

17. Write the converse, inverse and contra positive of "If two triangles are congruent then they are similar".

18. Solve using Cramer's rule :

$4x + y = 7$; $3y + 4z = 5$, $3z + 5x = 2$.

19. Find the eigen values and the eigen vectors of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$.

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

SECTION – C

Answer any **SIX** of the following : **(6 × 5 = 30)**

21. If $a^2+b^2=7ab$ show that

(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 6 examination question papers, out of which 2 are of mathematics, can be arranged, so that the two mathematics papers never come together.

23. Among 20 cricket players, there are two wicket keepers and 5 bowlers. In How many ways can 11 be chosen? So as to include only one wicket keeper and atleast three bowlers?

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

25. Show that (z_6, t_6), where $z_6=\{0, 1, 2, 3, 4, 5\}$ is a group.

26. If $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $|\vec{a}|=3$, $|\vec{b}|=5$, $|\vec{c}|=7$ find the angle between $\vec{a}$ and $\vec{b}$.

27. Show that the points $A(1, 2, 3)$, $B(2, 3, 1)$ and $C(3, 1, 2)$ are vertices of an equilateral triangle.

28. Find the area of the triangle whose vertices are $A=(1, 3, 2)$, $B(2, -1, 1)$, $C(-1, 2, 3)$.

SECTION – D

Answer any **FOUR** of the following : **(4 × 5 = 20)**

29. Show that the points (2, -3), (6, 5), (-2, 1) and (-6, -7) form a rhombus.

30. Find the area of the triangle whose vertices are (3, 4), (2, -1) and (4, -6).

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

32. Show that the points (1, 1), (3, -2) and (5, -5) are collinear using the concept of slope of the line.

33. Find the equations of the medians of the triangle whose vertices are (-1, 8), (4, -2) and (-5, -3).

34. Find the equations of the line for which

    (a) $p = 4,\ \alpha = 120^0$

    (b) $p = 7,\ \alpha = 60^0$.