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

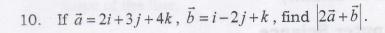
Answer any **TEN** of the following:

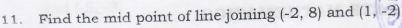


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- 1. Write the following sets in set-builder form
 - (a) $\{2, 4, 8, 16, 32, \dots\}$
 - (b) {1, 3, 5, 7, 9}.
- 2. Define subset. Give an example.
- 3. Let $A = \{1, 2, 3, 4, 5\}$, $B = \{1, 4, 5\}$. Let 'R' be a relation from A into B, defined by $R = \{(a,b)/a \in A, b \in B, a < b\}$
 - (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.





12. Define slope of a line.



SECTION - B

Answer any SIX of the following:

$$(6 \times 5 = 30)$$

- 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 $f: A \rightarrow B$ 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 $(p \land q) \land \neg (p \land q)$ is a contradiction.
- 16. Prove that $[p \land (q \lor r)] = [(p \land q) \lor (p \land q)].$
- 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 $A = \begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$.

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SECTION - C

Answer any SIX of the following:



- 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:

 $(4 \times 5 = 20)$

- 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, $\alpha = 120^{\circ}$
 - (b) p = 7, $\alpha = 60^{\circ}$.

