

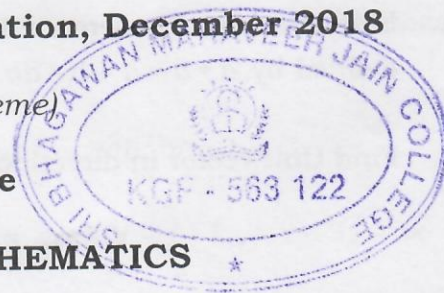
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First Semester B.C.A. Degree Examination, December 2018

(CBCS – Semester Scheme)

Computer Science

Paper III – DISCRETE MATHEMATICS



Time : 3 Hours]

[Max. Marks : 100

Instructions to Candidates : Answer all Sections.

SECTION – A

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

(10 × 2 = 20)

1. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{3, 8, 9, 12, 18\}$, $C = \{2, 4, 6, 9, 15\}$, find
(a) $A - B$ (b) $C - B$.
2. If $A = \{x/x^2 - 6x + 8 = 0\}$ and $B = \{2, 3\}$ find $A \times B$.
3. Define Conjunction.
4. Define diagonal matrix with an example.
5. If $A = \begin{bmatrix} 2 & -1 \\ 3 & -1 \end{bmatrix}$ find inverse of A.
6. Show that $\log\left(\frac{81}{16}\right) - \log\left(\frac{8}{9}\right) + \log\left(\frac{128}{243}\right) = \log 3$.
7. Find value of n if ${}^n P_2 = 12$.
8. State Cayley Hamilton theorem.
9. Find the slope of the line $2x - 3y + 5 = 0$.
10. Find $\vec{a} \cdot \vec{b}$ if $\vec{a} = \vec{i} + 2\vec{j}$; $\vec{b} = 2\vec{i} - 3\vec{j}$.

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11. Find the identity element in set of rational numbers except 1 w.r.t. $*$ which is defined by $a * b = a + b - ab$.
12. Find Unit vector in direction of $\bar{a} + \bar{b}$ if $\bar{a} = (1, 1, -1)$ and $\bar{b} = (1, -1, 3)$.

SECTION - B

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

13. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 3, 5, 7, 9\}$ and $B = \{1, 2, 4, 7, 8\}$ verify $(A \cup B)' = A' \cap B'$.
14. Show that the function $f : R \rightarrow R$ defined by $f(x) = 4x - 5$ is both one-one and onto.
15. Write converse, inverse and contrapositive of the conditional "If two integers are equal and their squares are equal".
16. Show that $p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$.
17. Determine whether $(p \vee q) \wedge (\sim p \wedge \sim q)$ is Tautology (or) Contradiction (or) Neither.
18. Find Eigen values and Eigen vectors of Matrix $A = \begin{pmatrix} 1 & 2 \\ 5 & 4 \end{pmatrix}$.
19. Using Cramer's Rule solve $x - y + 2z = 3$, $2x + z = 1$; $3x + 2y + z = 4$.
20. Solve by using Matrix method $2x - 3y = 1$ and $3x - y = 3$.

SECTION - C

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

21. If $\log(a + b) = \frac{1}{2} \log(3ab)$ show that $a^2 + b^2 = ab$.
22. If ${}^{(2n+1)}P_{n-1} : {}^{(2n-1)}P_n = 3 : 5$. Find n .
23. 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 has (a) exactly 3 girls (b) atleast 3 girls.

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24. Prove that the set $G = \{2, 4, 6, 8\}$ is an abelian group w.r.t. multiplication modulo 10.
25. Show that a group G is abelian if and only if $(ab)^2 = a^2b^2 \forall a, b \in G$.
26. Show that the points whose position vectors are $2\vec{i} - \vec{j} + \vec{k}$; $\vec{i} - 3\vec{j} - 5\vec{k}$ and $3\vec{i} - 4\vec{j} - 4\vec{k}$ form a right angled triangle.
27. Using Vector Method find the area of triangle whose vertices are $A(1, 3, 2)$, $B(2, -1, 1)$ and $C(-1, 2, 3)$.
28. Show that points $A(2, 3, -1)$, $B(1, -2, 3)$, $C(3, 4, -2)$ and $D(1, -6, 6)$ are coplanar.

SECTION - D

- IV. Answer any **FOUR** of the following : **(4 × 5 = 20)**
29. Find the coordinates of the point which divide the line joining pair of points (8, 9) and (-7, 4) internally in the ratio 2 : 3.
30. Show that the points (2, -2), (8, 4), (5, 7) and (-1, 1) are the vertices of a rectangle.
31. Find equation of the Locus of point which moves such that the sum of its distance from (0, 2) and (0, -2) is 6.
32. Find point of intersection of the straight line $3x + 4y + 1 = 0$ and $2x - y - 3 = 0$. Hence find the position of the point w.r.t. the given lines.
33. Find equation of the line passing through (3, -2) and inclined at an angle of 60° with the line $\sqrt{3}x + y = 1$.
34. Find value of K for which the lines $2x - Ky + 1 = 0$ and $x + (K + 1)y - 1 = 0$ are perpendicular.
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