SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.C.A - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - I
24UCAAT1001 - Allied Mathematics - I

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Determine the truth value of $(p \leftrightarrow \sim q) \leftrightarrow (q \rightarrow p)$.
2. Let I be the set of all integers and if the relation R be defined over the set I by xRy if $x - y$ is an even number where $x, y \in I$. Show that R is an equivalence relation.
3. Compute the number of odd numbers of 4 digits can be formed out of the digits 1, 2, ..., 9 if repetition of digits is (i) not allowed (ii) allowed.
4. When do you say that a matrix is orthogonal ? Show that the matrix $\frac{1}{3}\begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$ is orthogonal.
5. Find the expression of $\cos 6\theta$ in terms of $\cos\theta$.
6. Let f and g be functions defined by $f(x) = 3x + 4$ and $g(x) = x^2 + 2$. Compute $g \circ f$ and $f \circ g$.
7. Show that $\dfrac{\cos 5\theta}{\cos\theta} = 1 - 12\sin^2\theta + 16\sin^4\theta$.
8. Examine the matrix $\begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ for its eigen values and eigen vectors.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. (a) Utilize truth table method to prove that $p \rightarrow (q \rightarrow r) \equiv (p \wedge \sim r) \rightarrow \sim q$.
   (b) Translate into symbolic form and compute the validity of the argument.
   If 6 is even, then 2 does not divide 7
   Either 5 is not a prime or 2 divides 7
   But 5 is a prime.
   Therefore, 6 is odd.

Contd...

10. Out of a group of 50 teachers in a high school 30 teach Mathematics, 20 teach English and 25 teach Science. 10 teach both Mathematics and Science and none teach Mathematics and English. Compute

    (i) how many teach Science and English, and

    (ii) how many teach only English?

11. (a) There are 7 men and 3 ladies. Determine the number of ways in which a committee of 6 persons can be formed if the committee is to have at least 2 ladies.

    (b) Determine the number of ways the letters of the word STRANGE can be arranged so that the vowels may appear in the odd places.

12. Verify Cayley-Hermitian theorem for the matrix $A = \begin{bmatrix} 0 & 0 & 1 \\ 3 & 1 & 0 \\ -2 & 1 & 4 \end{bmatrix}$.

    Hence compute A^{-1}.

13. Infer that $\sin^9\theta = \frac{1}{256}[\sin 9\theta - 9\sin 7\theta + 36\sin 5\theta - 84\sin 3\theta + 126\sin\theta]$.

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