Course Code	**:**	**BCS-012**
Course Title	**:**	**Basic Mathematics**
Assignment Number	**:**	**BCA(I)012/Assignment/2023-24**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Date of Submission	**:**	**31st October, 2023 (For July Session)** **30th April, 2024 (For January Session)**

Note: This assignment has 16 questions of 80 marks (each question carries equal marks). Answer all the questions. Rest 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

Q1. If $A = \begin{pmatrix} 3 & -1 \\ 2 & 1 \end{pmatrix}$, **(5)**

Show that $A^2 - 4A + 5I_2 = 0$. Also, find A^4.

Q2. Find the sum of first all integers between 100 and 1000 which are divisible by 7. **(5)**

Q3. a) If p^{th} term of an A.P is q and q^{th} term of the A.P. is p, find its r^{th} term. **(5)**
b) Find the sum of all the integers between 100 and 1000 that are divisible by 9.

Q4. If 1, ω, ω^2 are cube roots of unity, show that **(5)**
$(2-\omega)(2-\omega^2)(2-\omega^{19})(2-\omega^{23}) = 49$.

Q5. If α, β are roots of $x^2 - 3ax + a^2 = 0$, find the value(s) of a if $\alpha^2 + \beta^2 = \frac{7}{4}$. **(5)**

Q6. If $y = In\frac{\sqrt{1+X}-\sqrt{1-X}}{\sqrt{1+X}+\sqrt{1-X}}$, find $\frac{dy}{dX}$. **(5)**

Q7. Evaluate : $\int x^2\sqrt{5x-3}dx$ **(5)**

Q8. Use De Moivre's theorem to find $(\sqrt{3}+i)^3$. **(5)**

Q9. Solve the equation $x^3 - 13x^2 + 15x + 189 = 0$, Given that one of the roots exceeds the other by 2. **(5)**

Q10. Solve the inequality $\left|\frac{2}{X-1} > 5\right|$ and graph its solution. **(5)**

Q11. Determine the values of x for which $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 21$ is increasing and for which it is decreasing. **(5)**

Q12. Find the points of local maxima and local minima of **(5)**
$f(x) = x^3 - 6x^2 + 9x + 2014$, $x \in \mathbf{R}$.

Q13. Using integration, find length of the curve $y = 3 - x$ from (-1, 4) to (3, 0). **(5)**

Q14. Show that the lines, given below, Intersect each other. **(5)**

$\frac{X-5}{4} = \frac{y-7}{-4} = \frac{z-3}{-5}$ and $\frac{X-8}{4} = \frac{y-4}{-4} = \frac{z-5}{4}$

Q15. A tailor needs at lease 40 large buttons and 60 small buttons. In the market, buttions are available in two boxes or cards. A box contains 6 large and 2 small buttons and a card contains 2 large and 4 small buttons. If the cost of a box is $3 and cost of a card is $2, find how many boxes and cards should be purchased so as to minimize the expenditure. **(5)**

Q16. Find the scalar component of projection of the vector **(5)**

$\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + 5\hat{k}$ on the vector $\vec{b} = 2\hat{\imath} - 2\hat{\jmath} - \hat{k}$