ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Science Education)

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All questions are compulsory and carry equal marks, but within a question, the marks are distributed according to its requirements.

1. Read the question carefully and answer it according to the requirements of the question.
2. Avoid irrelevant discussion/information and reproducing from books, study guide or allied material.
3. Handwritten scanned assignments are not acceptable.
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5. Your own analysis and synthesis will be appreciated.
6. Late assignments can't be uploaded to LMS.
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Course: MATHEMATICS-II (6447)
Level: B.ED (2.5/4 Years) **Semester: Spring 2026**
Total Marks: 100 **Passing Marks: 50**

ASSIGNMENT No. 1
(Units: 1–4)

Q1. Determine the complete solution set for the absolute value inequality $|3(2x + 6) - 9| \leq 12$ using the properties of the real number system, map this interval clearly onto a real number line, and state whether the resulting solution interval forms a bounded or unbounded function domain. **[20 Marks]**

Q2. Evaluate the trigonometric limit $\lim_{x\to 0}\frac{1-Cos5x}{x^2}$ by applying fundamental limit laws and identities, and mathematically verify if a function defined as $f(x) = \frac{1-Cos5x}{x^2}$ for $x \neq 0$ can be made continuous at $x = 0$ by defining $f(0)$ equal to this limiting value. **[20 Marks]**

Q3. Find the first derivative $\frac{dy}{dx}$ of the composite logarithmic function $y = \ln\left(\sqrt{\frac{1+sinx}{1-sinx}}\right)$ by implementing algebraic simplifications along with the chain and quotient rules of differentiation, and reduce your final answer to its simplest trigonometric form. **[20 Marks]**

Q4. Using the rules of successive differentiation, determine the general. n_{th} derivative formula y_n for the rational algebraic function $y = \frac{1}{x^2-5x+6}$ by first decomposing the function expression into its linear partial fractions. **[20 Marks]**

Q5. Given the function $y = cos(m\, Sin^{-1}x)$, apply **Leibniz's Theorem** for the nth derivative of a product of two functions to prove that its successive derivatives satisfy the differential equation relation $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2 - n^2)y_n = 0$. **[20 Marks]**

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ASSIGNMENT No. 2
(Units: 5–9)

Q1. State the **Mean Value Theorem** for a real-valued function $f(x)$ continuous on a closed interval $[a, b]$ and differentiable on the open interval (a, b), and find the exact value of the constant $c \in (a, b)$ that satisfies the conclusion of this theorem for the specific function $f(x) = x^3 - 3x - 1$ defined over the interval $[\frac{-1}{2}, 3]$. **[20 Marks]**

Q2. Evaluate the indefinite integral $\int x^3 . lnx\, dx$ by implementing the **Integration by Parts** method, establishing your choice of the first and second functions according to logarithmic differentiation rules, and reducing your final anti-derivative solution to its simplest algebraic form, including the constant of integration. **[20 Marks]**

Q3. Evaluate the indefinite integral $\int \frac{3x^2-x+1}{(x-1)(x^2+1)} dx$ by first decomposing the integrand into its appropriate real **partial fractions** containing a linear denominator and an irreducible quadratic denominator, and then integrating each fraction term-by-term to find the complete logarithmic and inverse trigonometric solution. **[20 Marks]**

Q4. State the **Fundamental Theorem of Calculus,** which links differentiation and integration, and use it to compute the exact numerical value of the definite area integral $\int_0^{\frac{\pi}{4}} (x.\ Sec^2 x)\, dx$ by carrying out a definite integration process from the lower boundary limit to the upper boundary limit. **[20 Marks]**

Q5. Approximate the total area bounded under the curve of the function $f(x) = \frac{1}{1+x^2}$ from $x = 0$ to $x = 2$ by applying **Simpson's Rule** of numerical integration using exactly $n = 4$ equal subintervals, showing the calculation for the step size h along with all coordinate values y_0, y_1, y_2, y_3, y_4 up to four decimal places. **[20 Marks]**