ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD.

(Department of Computer Science)

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Course: Pre-Calculus I (3001/3517) **Semester: Spring, 2026**
Level: BS

Please read the following instructions for writing your assignments. (AD, BS, B.Ed, MA/MSc, Med, ODL Mode)

1. All questions are compulsory and carry equal marks, but within a question, the marks are distributed according to its requirements.
2. Read the question carefully and answer it according to the requirements of the question.
3. Avoid irrelevant discussion/information and reproducing from books, study guides, or allied material.
4. Handwritten scanned assignments are not acceptable.
5. Upload your typed (in Word or PDF format) assignments on or before the due date.
6. Your own analysis and synthesis will be appreciated.
7. Late assignments can't be uploaded to the LMS.
8. The students who attempt their assignments in Urdu/Arabic may upload a scanned copy of the handwritten assignments (in PDF format) on the University LMS. The size of the file should not exceed 5MB.

Total Marks: 100 **Pass Marks: 50**

Assignment No. 1
(Units 1-4)

Note: Attempt all questions and each question carries equal marks.

Q # 01 **(10+10)**

(a) Prove that $f(x) = \cos x$ is an even function and sketch its graph for $-2\pi \le x \le 2\pi$, marking all intercepts and extrema.

(b) Determine whether the function $f(x) = \frac{(x^2-4)}{(x-2)}$ has a removable or non-removable discontinuity at $x = 2$. Justify your answer.

Q # 02 **(10+10)**

(a) Use synthetic division to divide $p(x) = 3x^4 - 2x^3 + x^2 - 5x + 4$ by $(x - 1)$ and verify using the Remainder Theorem.

(b) Explain why the rational function $f(x) = \frac{(x^2-9)}{(x-3)(x+1)}$ has a hole at $x = 3$ and a vertical asymptote at $x = -1$. Sketch the graph.

Q # 03 **(10+10)**

(a) Given $f(x) = \sqrt{x+3}$ and $g(x) = x^2$, find $(f \circ g)(x)$ and $(g \circ f)(x)$. Compare their domains.

(b) Find the inverse of $f(x) = \frac{2x+5}{x-1}$ and verify that $f(f^{-1}(x)) = x$.

Q # 04 **(10+10)**

(a) State and prove the Intermediate Value Theorem. Give a real-world example illustrating its use.

(b) Determine the points of discontinuity of $f(x) = [x]$ (greatest integer function) and classify each type.

Q # 05 **(10+10)**

(a) Find the domain and range of $f(x) = ln(x - 2) + 3$. Find its inverse and state the domain and range of the inverse.

(b) If $A = \{1, 3, 5, 7\}$ and $B = \{3, 5, 6, 8\}$, verify De Morgan's law: $(A \cap B)' = A' \cup B'$.

Total Marks: 100 **Pass Marks: 50**

Assignment No. 2
(Units 5-9)

Note: Attempt all questions, and each question carries equal marks.

Q # 01 **(10+10)**

(a) Use Cramer's Rule to solve the system: $5x - 3y = 1,\ 2x + 4y = 14$.

(b) Solve the following system using Gaussian elimination: $2x + y + z = 8,\ x - y + 2z = 5,\ 3x + 2y - z = 7$.

Q # 02 **(10+10)**

(a) The 5^{th} term of an arithmetic sequence is 17, and the 12^{th} term is 38. Find the first term and the common difference. Then find the sum of the first 25 terms.

(b) Find the sum of the infinite geometric series: $27 + 9 + 3 + 1 + \ldots$. Also state the condition for convergence.

Q # 03 **(10+10)**

(a) In triangle PQR, $p = 10$, $q = 7$, and $\angle R = 45°$. Use the law of cosines to find side r and all angles.

(b) Sketch the graphs of $y = tan(x)$ and $y = cot(x)$ for $0 \le x \le 2\pi$. Mark asymptotes, intercepts, and

Q # 04 **(10+10)**

(a) For the ellipse $9x^2 + 16y^2 = 144$, find the center, vertices, co-vertices, foci, and eccentricity. Sketch

(b) Find the equation of the parabola with vertex at the origin, axis along the x-axis, and passing through (3, 6).

Q # 05 **(10+10)**

(a) Convert the polar equation $r = 4\ sin\ \theta$ to Cartesian form and identify the curve. Sketch it.

(b) A particle moves along the path $x = 3\ cos(t)$, $y = 2\ sin(t)$. Find the cartesian equation and the arc length for $0 \le t \le \pi/2$.