# MCQ Paper - test

## Generated Question Paper

*MCQ Examination*

Name: _____

Class: _____ Section: _____

Roll no.: _____

**Instructions:**

- Fill OMR sheet with blue/black pen.
- Fill circles completely.
- No stray marks.
- Enter Name, Class, Section.

**SET A**

Questions: **9**
Duration: **120min**

## Calculus: Differentiation and Integration

*This section covers fundamental and advanced topics in differential and integral calculus.*

**1.** *Evaluate the definite integral:*
*∫₀^(π/2) sin²(x) dx*

**A.** 1 **B.** π/2
**C.** π/4 **D.** 0

**2.** *Consider the function of two variables provided below:*

Let f(x, y) be a differentiable function defined as f(x, y) = e^(xy) * cos(x² + y²).

*What is the value of the partial derivative ∂f/∂x at the point (0, 0)?*

**A.** e **B.** -1
**C.** 1 **D.** 0

**3.** *The Fundamental Theorem of Calculus connects the concepts of differentiation and integration.*

**Statement I:**

If F'(x) = f(x) for all x in [a, b], then ∫ f(x) dx = F(b) - F(a).

**Statement II:**

If f is continuous on [a, b], then the function G(x) = $\int^{x}$ f(t) dt is differentiable on (a, b) and G'(x) = f(x).

*Which of the statements above are considered parts of the Fundamental Theorem of Calculus?*

**A.** Statement II only
**B.** Neither statement is correct
**C.** Statement I only
**D.** Both Statement I and Statement II

## Linear Algebra: Matrices and Vector Spaces

*This section tests knowledge of matrix properties, linear transformations, and vector spaces.*

**4.** *Match each type of matrix in Column A with its defining property in Column B.*

| Column A: Matrix Type | - | Column B: Property |
|---|---|---|
| 1. Orthogonal | - | a. $A = A$ |
| 2. Symmetric | - | b. $A^2 = A$ |
| 3. Skew-Symmetric | - | c. $A = -A$ |
| 4. Idempotent | - | d. $A^{-1} = A$ |

*Which option represents the correct matching?*

**A.** 1-b, 2-a, 3-d, 4-c
**B.** 1-a, 2-d, 3-b, 4-c
**C.** 1-d, 2-c, 3-a, 4-b
**D.** 1-d, 2-a, 3-c, 4-b

**5.** *For any two $n \times n$ matrices A and B, which of the following properties is NOT always true?*

i. $\det(A) = \det(A)$
ii. $\det(AB) = \det(A)\det(B)$
iii. $\det(A + B) = \det(A) + \det(B)$
iv. If A is invertible, $\det(A^{-1}) = 1/\det(A)$

**A.** Property iv **B.** Property iii
**C.** Property ii **D.** Property i

**6.** Let T: $\mathbb{R}^3 \rightarrow \mathbb{R}^2$ be a linear transformation defined by the rule $T(x, y, z) = (x + 2y - z, 3x + y + 4z)$.

*Based on the transformation T, evaluate the following statements:*

**Statement I:**

The kernel (null space) of T has a dimension greater than zero.

**Statement II:**

The transformation T is surjective (onto).

*Which assessment of the statements is correct?*

**A.** Both statements are false
**B.** Statement I is true, Statement II is false
**C.** Both statements are true
**D.** Statement I is false, Statement II is true

## Complex Analysis and Series

*Questions on complex numbers, Euler's formula, and the convergence of infinite series.*

**7.** *For a complex number $z = a + ib$, where $i^2 = -1$, consider the following statements:*

**Assertion (A):**

The modulus $|z|$ is given by the formula $\sqrt{(a^2 + b^2)}$.

**Reason (R):**

$|z|$ geometrically represents the distance of the point (a, b) from the origin in the Argand (complex) plane.

*Which of the following is true regarding statements (A) and (R)?*

**A.** Both (A) and (R) are true, and (R) is the correct explanation of (A).
**B.** (A) is false but (R) is true.
**C.** (A) is true but (R) is false.
**D.** Both (A) and (R) are true, but (R) is not the correct explanation of (A).

**8.** Consider the infinite series $S = \Sigma_{n=1 \text{ to } \infty} ((-1)^n * n) / (n^2 + 1)$.

*Determine the nature of the convergence of the series S.*

**A.** Absolutely convergent

**B.** The series does not converge or diverge

**C.** Divergent

**D.** Conditionally convergent

**9.** Euler's formula states that $e^{(i\theta)} = \cos(\theta) + i \sin(\theta)$, linking complex exponentials with trigonometric functions.

*Using this formula, which step in the following simplification of $e^{(i\pi)} + 1$ contains an error?*

Step 1: Substitute $\theta = \pi$ into the formula, yielding $e^{(i\pi)} = \cos(\pi) + i \sin(\pi)$.

Step 2: Evaluate the trigonometric functions: $\cos(\pi) = -1$ and $\sin(\pi) = 0$.

Step 3: Conclude that $e^{(i\pi)} = -1 + i(0) = -1$.

Step 4: Perform the final addition: $e^{(i\pi)} + 1 = 1 + 1 = 2$.

**A.** Step 3 **B.** Step 1

**C.** Step 4 **D.** Step 2

* * * * **END** * * * *