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BF—82—2016

FACULTY OF SCIENCE

B.Sc. (First Year) (First Semester) EXAMINATION

OCTOBER/NOVEMBER, 2016

(Old Course)

MATHEMATICS

Paper II

(Algebra and Trigonometry)

(MCQ+Theory)

(Friday, 21-10-2016) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) First **30** minutes for Question No. **1** and remaining time for other questions.

(*iii*) Negative marking system is applicable for Q. No. **1**.

(*iv*) Use black ball point pen to darken the circles on OMR for correct choice answer. Circle once darkened, is final.

(*v*) Figures to the right indicate full marks.

(MCQ)

1. Choose the most *correct* alternative for each of the following : 1 each

(*i*) If A is *n*-square matrix, then matrix Å is :

(*a*) null matrix of order $n \times n$

(*b*) zero

(*c*) identity matrix of order $n \times n$

(*d*) *n*-square upper triangular matrix

(*ii*) If $A = [a_{ij}]_{n \times n}$ matrix such that $a_{ij} = 0$ for $i \neq j$, then matrix A is :

(*a*) a lower triangular matrix

(*b*) an upper triangular matrix

(*c*) a matrix whose non-diagonal elements are non-zero

(*d*) a diagonal matrix

(*iii*) If A^{θ} denotes the transposed conjugate of matrix A, then A^{θ} is expressed as :

(*a*) $(A^{-1})^{-1}$ (*b*) $(\overline{A'})$

(*c*) $(\overline{A})'$ (*d*) Both (*b*) and (*c*)

(*iv*) If A is a square matrix such that $A' = A^{-1}$, then matrix A is :

(*a*) symmetric matrix (*b*) skew-symmetric matrix

(*c*) orthogonal matrix (*d*) none of these

(*v*) No. of elementary operations or transformations on matrix are :

(*a*) 6 (*b*) 5

(*c*) 4 (*d*) 3

(*vi*) The system AX = B of *m* linear equations in *n* unknowns has no solution, if :

(*a*) $\rho(A) = \rho([A : B]) = n$ (*b*) $\rho(A) \neq \rho([A : B])$

(*c*) $\rho(A) = \rho([A : B]) = r < n$ (*d*) All of these

(*vii*) Rank of identity matrix of order *n* is :

(*a*) less than *n* (*b*) equal to *n*

(*c*) 1 (*d*) 0

(*viii*) If $z = x + iy$ is a complex number, then modulus of z is :

(*a*) $\sqrt{x + y}$ (*b*) $\sqrt{x^2 + y^2}$

(*c*) $(x + y)$ (*d*) $(x^2 + y^2)$

(*ix*) The complex quantity $(\cos\theta + i\sin\theta)^{-1}$ is equal to :

(*a*) $\cos\theta - i\sin\theta$ (*b*) $\dfrac{1}{\cos\theta + i\sin\theta}$

(*c*) $\cos(-\theta) + i\sin(-\theta)$ (*d*) All of these (*x*) For all values of x real or complex, Euler's exponential value of cos x is :

(*a*) $\dfrac{2}{e^x + e^{-x}}$ (*b*) $\dfrac{e^x - e^{-x}}{2i}$

(*c*) $\dfrac{e^{x_i} - e^{-x_i}}{2}$ (*d*) $\dfrac{e^{x_i} + e^{-x_i}}{2}$

(Theory)

2. Attempt any *two* of the following : 5 each

(*a*) If A, B, C are three matrices of type $m \times n$, $m \times n$, $n \times p$ respectively, then prove that :

$$(A + B)C = AC + BC.$$

(*b*) By using principle of Mathematical induction prove that if :

$$A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}, \text{ then } A^n = \begin{bmatrix} 1 + 2n & -4n \\ n & 1 - 2n \end{bmatrix}$$

n being positive integer.

(*c*) Prove that inverse of a square matrix, if it exists is unique.

3. Attempt any *two* of the following : 5 each

(*a*) Prove that the elementary operations do not alter the rank of the matrix.

(*b*) Find the row rank of the matrix :

$$\begin{bmatrix} 0 & -1 & 2 \\ 4 & 3 & 1 \\ 4 & 2 & 3 \end{bmatrix}.$$

(*c*) Prove that a system AX = B of n non-homogeneous equations in n unknowns has a unique solution provided A is non-singular i.e. $\rho(A) = n$.

4. Attempt any *two* of the following : 5 each

(*a*) State and prove De-Moivre's theorem for positive and negative integers.

(*b*) Expand sin α in terms of α, i.e. in ascending powers of α.

(*c*) Expand $\cos^8 \theta$ in a series of cosines of multiples of θ.