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AO—76—2018

FACULTY OF ARTS AND SCIENCE

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

MARCH/APRIL, 2018

(CBCS/CGPA Pattern)

MATHEMATICS

Paper II

(Algebra and Trigonometry)

(MCQ & Theory)

(Wednesday, 28-03-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

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

(*ii*) Negative marking system for MCQs is applicable.

(*iii*) Use black ball point pen to darken the circle of correct answer in OMR answer sheet. Circle once darken is final.

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

MCQ

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

(*i*) If $A^2 = A$, then a square matrix A is said to be :

(*a*) Involutary Matrix (*b*) Idempotent Matrix

(*c*) Nilpotent Matrix (*d*) None of these

(*ii*) A be any given matrix of order $m \times n$, then a matrix obtained from A by changing its rows into columns and columns into rows is called :

(*a*) Conformable of matrix A (*b*) Inverse of matrix A

(*c*) Transpose of a matrix A (*d*) Invertible of a matrix A

P.T.O.

(*iii*) If $A = [\bar{a}_{ij}]$ is a square matrix of order n and A_{ij} is the cofactor of a_{ij} in $|A|$, then the matrix $[A_{ij}]' = \begin{bmatrix} A_{11} & A_{21} & \ldots\ldots & A_{n1} \\ A_{12} & A_{22} & \ldots\ldots & A_{n2} \\ \vdots & \vdots & \vdots & \vdots \\ A_{1n} & A_{2n} & \ldots\ldots & A_{nn} \end{bmatrix}$

is called :

(*a*) The adjoint of A (*b*) Co-factor of A

(*c*) The minor of A (*d*) None of these

(*iv*) Let A be an n-square matrix. If there exists an n-square matrix B such that

$$AB = BA = I_n$$

then the matrix A is said to be :

(*a*) Inverse of matrix A (*b*) Symmetric matrix

(*c*) Invertible matrix (*d*) Adjoint of matrix A

(*v*) If matrix A has a non-zero minor of order K, then :

(*a*) $\rho(A) \le \min. (m, n)$ (*b*) $\rho(A) \ge K$

(*c*) $\rho(A) \ge \min. (m, n)$ (*d*) $\rho(A) \le K$

(*vi*) The number of non-zero rows in the row-echelon form of a matrix A, is called :

(*a*) Row equivalent (*b*) Column equivalent

(*c*) Inverse of A (*d*) Row rank of A

(*vii*) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$, then rank of matrix A is :

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) –1

(*viii*) Let n be the positive integer, then which of the following is *true* ?

(*a*) $\cos n\theta + i \sin n\theta = (\cos \theta - i \sin \theta)^n$

(*b*) $\cos n\theta + i \sin n\theta = (\cos \theta + i \sin \theta)^n$

(*c*) $\cos n\theta - i \sin n\theta = (\cos \theta + i \sin \theta)^n$

(*d*) $\cos n\theta + i \sin n\theta = n(\cos \theta + i \sin \theta)$

(*ix*) The quantity $\frac{e^y + e^{-y}}{2}$ is called :

(*a*) The hyperbolic cosine of y

(*b*) The hyperbolic sine of y

(*c*) The circular functions of cosine of y

(*d*) None of the above

(*x*) For all values of x, real or complex, the following is true :

(*a*) $\cos x = \frac{e^{x_i} - e^{-x_i}}{2i}$

(*b*) $\cos x = \frac{e^{x_i} + e^{-x_i}}{2i}$

(*c*) $\cos x = \frac{e^{x_i} + e^{-x_i}}{2}$

(*d*) $\cos x = \frac{e^{x_i} - e^{-x_i}}{2}$

Theory

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

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

$$A(B + C) = AB + AC$$

(*b*) If A be a n-square matrix, then prove that :

$$A(\text{adj. } A) = (\text{adj. } A)A = |A| I_n$$

P.T.O.

(*c*) Find the adjoint of matrix A, where

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$$

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

(*a*) If AX = 0 is a homogeneous system of equations in n unknowns and

$$X_1 = (x_1, x_2, \ldots\ldots x_n) \text{ and}$$
$$X_2 = (y_1, y_2, \ldots\ldots y_n)$$

are two solutions of this system, then $X_1 + X_2 = (x_1 + y_1, x_2 + y_2, \ldots\ldots, x_n + y_n)$ is also a solution.

Also, if λ is a scalar, then $\lambda X_i = (\lambda x_1 + \lambda x_2, \ldots\ldots \lambda x_n)$ is also a solution.

(*b*) 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.*, $\rho(A) = n$.

(*c*) Find a row echelon matrix which is row equivalent to

$$A = \begin{bmatrix} 0 & 0 & -2 & 3 & 1 \\ 2 & 4 & 1 & 4 & 3 \\ 1 & 2 & -3 & 1 & 2 \\ 4 & 8 & 2 & 3 & 5 \end{bmatrix}$$

and find $\rho R(A)$.

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

(*a*) Expand $\cos^n \theta$ in a series of cosines of multiples of θ, n being a positive integer.

(*b*) Expand $\sin \alpha$ in terms of α.

(*c*) Find modulus and amplitude of quantity $-1+\sqrt{-3}$.