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V—77—2017

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2017

(CBCS/CGPA)

MATHEMATICS

Paper II

(Algebra and Trigonometry)

(MCQ + Theory)

(Tuesday, 14-11-2017) **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 Q. No. 1 (MCQ) and remaining time for theory.

(*iii*) Negative marking system for MCQ is applicable.

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

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

MCQ

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

(1) A square matrix A is said to be Involutory Matrix if :

(A) $A^2 = A$ (B) $A^m = 0$

(C) $A^2 = I$ (D) $A^2 = 0$

(2) If every minor of order K + 1 of A vanishes, then :

(A) $\rho(A) \geq K$ (B) $\rho(A) \leq K$

(C) $\rho(A) = K$ (D) $\rho(A) = 0$

(3) A square matrix A is said to be singular matrix if :

(A) $|A| < 0$ (B) $|A| > 0$

(C) $|A| = 0$ (D) $|A| \neq 0$

P.T.O.

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

(A) Inverse of a matrix A

(B) Transpose of a matrix A

(C) Conjugate of a matrix A

(D) Symmetric matrix of a matrix A

(5) If

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$$

then :

(A) $\rho(A) = 0$ (B) $\rho(A) = 1$

(C) $\rho(A) = 3$ (D) $\rho(A) = 2$

(6) The system AX = B of m linear equations in n unknowns has a unique solution if :

(A) $\rho(A) = \rho([A : B]) = n$

(B) $\rho(A) = \rho([A : B]) = r < n$

(C) $\rho(A) \neq \rho([A : B])$

(D) $\rho(A) = \rho([A : B]) = r > n$

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

(A) Row rank of A (B) Column rank of A

(C) Row-echelon matrix (D) Orthogonal matrix

(8) If $z = x + iy$ is a complex number, then the quantity $\sqrt{x^2 + y^2}$ is called :

(A) Amplitude (B) Modulus

(C) Radians (D) None of these

(9) If y be real or complex, then the hyperbolic function :

(A) $\sinh y = \dfrac{e^y + e^{-y}}{2}$ (B) $\sinh y = \dfrac{e^x + e^{-y}}{2}$

(C) $\sinh y = \dfrac{e^y - e^{-y}}{2}$ (D) $\sinh y = \dfrac{e^{-y} + e^y}{2}$

(10) For all values of x, real or complex, Euler's exponential value of $\sin x$ is :

(A) $\dfrac{e^{xi} + e^{-xi}}{2}$ (B) $\dfrac{e^{xi} - e^{-xi}}{2i}$

(C) $\dfrac{e^{-xi} + e^{+xi}}{2}$ (D) $\dfrac{2}{e^{xi} - e^{-xi}}$

Theory

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

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

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

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

(*c*) Calculate the adjoint of A, where :

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

P.T.O.

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

(*a*) If X_1 is a solution of AX = B and X_2 is any solution of the associated system AX = 0, then prove $X_1 + X_2$ is a solution of AX = B further if Y is a solution of AX = B, then $Y - X_2$ is a solution of AX = 0.

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

(*c*) Reduce to row echelon form the matrix :

$$A = \begin{bmatrix} 1 & -2 & -1 & 4 \\ 2 & -4 & 3 & 5 \\ -1 & 2 & 6 & -7 \end{bmatrix}$$

Also find row rank of A.

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

(*a*) State DeMoivre's Theorem and prove it for fractional numbers.

(*b*) Expand $\cos^7 \theta$ in a series of cosines of multiples of θ.

(*c*) Separate into its real and imaginary parts the expression $\sin(\alpha + \beta i)$.