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W—88—2018

FACULTY OF ARTS AND SCIENCE

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

OCTOBER/NOVEMBER, 2018

(CBCS/CGPA)

MATHEMATICS

Paper II

(Algebra and Trigonometry)

(MCQ+Theory)

(Saturday, 20-10-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

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

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

(*iv*) Use black ball pen to darken the correct choice circle in OMR-sheet.

(MCQ)

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

(*i*) If A is a matrix of order $m \times n$ and B and C are matrices of same order $n \times p$, then the order of matrix A (B + C) is :

(A) $m \times n$ (B) $n \times p$

(C) $m \times p$ (D) None of these

(*ii*) A square matrix A is such that $A^m = 0$, where m is least the integer, then matrix A is called as :

(A) Idempotent matrix (B) Nilpotent matrix

(C) Involutary matrix (D) None of these

(*iii*) If $A = [a_{ij}]$ is any square matrix, then det A_{ij} is called :

(A) Minor of (i, j)th entry a_{ij} of matrix A

(B) Co-factor of a_{ij} of matrix A

(C) Involutory element of A

(D) None of the above

P.T.O.

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

$$AB = BA = I_n$$

then :

(A) $A^{-1} = B$ (B) $B^{-1} = A$

(C) Both (*a*) and (*b*) (D) None of these

(*v*) If A is any $m \times n$ matrix, then rank of matrix A is denoted by $\rho(A)$ and is :

(A) $\geq \min(m, n)$ (B) $= \min(m, n)$

(C) $\leq \min(m, n)$ (D) All of these

(*vi*) Total no. of elementary operations or transformations is :

(A) 3 (B) 4

(C) 5 (D) 6

(*vii*) If A be a matrix of order 5×6, which is in row-echelon form, containing two zero rows, then row rank of matrix A is :

(A) 6 (B) 5

(C) 4 (D) 3

(*viii*) The value of complex number $(\cos\theta + i\sin\theta)^{\frac{3}{4}}$ is :

(A) $\left(\cos\frac{\theta}{4} + i\sin\frac{\theta}{4}\right)^3$ (B) $\left(\cos\frac{3}{4}\theta + i\sin\frac{3}{4}\theta\right)$

(C) $(\cos 3\theta + i\sin 3\theta)^{\frac{1}{4}}$ (D) All of these (*ix*) The value of sin α in ascending powers of α is :

(A) $\sin \alpha = 1 + \alpha + \frac{\alpha^2}{2!} + \frac{\alpha^3}{3!} + ...$

(B) $\sin \alpha = 1 - \frac{\alpha^2}{2!} + \frac{\alpha^4}{4!} - \frac{\alpha^6}{6!} + ...$

(C) $\sin \alpha = \alpha - \frac{\alpha^3}{3!} + \frac{\alpha^5}{5!} - \frac{\alpha^7}{7!} + ...$

(D) None of the above

(*x*) The quantity $e^{-\theta i}$, where θ is real and $i = \sqrt{-1}$ can be represented by :

(A) $\cos \theta + i \sin \theta$ (B) $\sin \theta - i \cos \theta$

(C) $\cos \theta - i \sin \theta$ (D) $\sin \theta + i \cos \theta$

(Theory)

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

(*i*) If A, B, C are matrices of order $m \times n$, $n \times p$, $p \times q$ respectively, then prove that :

$$(AB)C = A(BC)$$

(*ii*) Calculate the adjoint of matrix A, where :

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

(*iii*) If A and B are square matrices of order *n*, then prove that AB is invertible if and only if A and B are invertible and then prove that $(AB)^{-1} = B^{-1}.A^{-1}$.

P.T.O.

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

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

(*ii*) 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.

(*iii*) If X_1 is a solution of $AX = B$ and X_2 is any solution of associated system $AX = O$, then prove that $X_1 + X_2$ is also a solution of $AX = B$. Further if Y is a solution of $AX = B$, then $Y - X_1$ is a solution of $AX = O$.

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

(*i*) State and prove De-Moivre's theorem.

(*ii*) Express $\sin \theta$ in a series of cosines of multiples of θ where n is even.

(*iii*) Separate into its real and imaginary parts the expression :

$$\sin(\alpha + \beta i).$$