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B—102—2019

FACULTY OF ARTS/SCIENCE

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

MARCH/APRIL, 2019

(CBCS/CGPA Pattern)

MATHEMATICS

Paper II

(Algebra and Trigonometry)

(MCQ+Theory)

(Saturday, 30-3-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

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

(*ii*) Negative system for MCQ 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 $A = [a_{ij}]$ and $B = [b_{ij}]$ be any two matrices of the same type $m \times n$ and x and y are scalars, then which one of the following is wrong ?

(A) $x(A + B) = xA + xB$ (B) $(x + y)\,A = xA + yA$

(C) $x(yA) \neq (xy)A$ (D) $A(x + y) = Ax + Ay$

(*ii*) If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$, $n \in \mathbf{N}$, then A^{4n} equals to :

(A) $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (D) None of these

P.T.O.

(*iii*) If the matrix AB is zero, then :

(A) It is not necessary that either A = 0 or B = 0

(B) A = 0 or B = 0

(C) A = 0 and B = 0

(D) All the above statements are wrong

(*iv*) The rank of the matrix $A = \begin{bmatrix} 2 & 6 & -2 \\ 5 & 1 & -4 \\ -2 & -4 & -3 \end{bmatrix}$ is :

(A) 1 (B) 2

(C) 0 (D) 3

(*v*) The no. of solutions to the system $x + y = 0$ is/are :

(A) Unique (B) Infinite

(C) Only one solution (D) Two solutions (only)

(*vi*) If AX = B is a non-homogeneous system of equations, then system have unique solution if :

(A) $\rho(A) = \rho[A : B]$ (B) $\rho(A)$ = no. of unknown

(C) $\rho(A) \leq \rho[A : B]$ (D) Both (A) and (B)

(*vii*) Which one of the following matrix is in raw reduced echelon form ?

(A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 & -1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

(*viii*) The modulus of a complex quantity $3 + 4i$ is :

(A) 25 (B) –25

(C) 5 (D) –5

(*ix*) If $x = \cos\theta + i \sin\theta$, then $x - \frac{1}{x}$ is equal to :

(A) $2 \sin\theta$ (B) $2i \sin\theta$

(C) $\cos 2\theta$ (D) $2 \cos\theta$

(*x*) Which one of the following is *true* ?

(A) $\cos x = \frac{e^{ix} + e^{ix}}{2}$ (B) $\sin x = \frac{e^{ix} - e^{ix}}{2i}$

(C) $\sin x = \frac{e^{ix} - e^{-ix}}{2}$ (D) $\cos x = \frac{e^{ix} + e^{-ix}}{2}$

(Theory)

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

(*a*) Prove that the necessary and sufficient conditions for a square matrix A to possess the inverse is that $|A| \neq 0$.

(*b*) If $A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ find AB, BA.

Is AB = BA ?

(*c*) Show that the matrix $A = \frac{1}{2}\begin{bmatrix} 1+i & -1+i \\ 1+i & 1-i \end{bmatrix}$ in unitary.

P.T.O.

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

(*a*) A system AX = B of n linear equations in n unknown is consistent if and only if the coefficient matrix A and the augmented matrix [A : B] of the system have the same rank.

(*b*) Solve the system of equations :

$$x + 3y - 2z = 0$$
$$2x - y + 4z = 0$$
$$x - 11y + 14z = 0.$$

(*c*) Find the characteristic roots of the matrix :

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}.$$

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

(*a*) Expand $\sin^n_\theta$ in a series of cosines or sines of multiple of θ, according as n is even.

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

(*c*) Separate into real and imaginary parts of the quantity : $\sin^{-1}(\cos\theta + i \sin\theta)$, where θ is real.