[33] SEAT No._____ No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY
M.Sc External Examination, Semester - I
Friday Date : 22-3-2019
Time : 10:00 am to 1:00 pm
Subject/Course Code : PS01CSTA02
Matrix Algebra

Q-1 Attempt following 08

1 In usual notation $A^{\perp}$ denotes
- a Orthogonal compliment of matrix A
- b g-inverse of matrix A
- c Inverse of matrix A
- d Non-of-above.

2 In usual notation A^{-} denotes
- a Orthogonal compliment of matrix A
- b g-inverse of matrix A
- c Inverse of matrix A
- d Non-of-above.

3 In usual notation A^{-1} denotes
- a Orthogonal compliment of matrix A
- b g-inverse of matrix A
- c Inverse of matrix A
- d Non-of-above.

4 In usual notation length vector for vector $\underline{X}' = [1 \quad 2 \quad 3]$ is
- a 14.
- b $\sqrt{14}$.
- c $1/\sqrt{14}$
- d Non-of-above.

5 In usual notation λ denotes latent roots of matrix A then latent roots of $A \pm cI$ is
- a $c\lambda$.
- b $c\lambda^{-1}$.
- c $c^{-1}\lambda$.
- d Non-of-above.

6 In usual notation basis of vector space
- a Always exist.
- b Is unique.
- c Not always exist.
- d Non-of-above.

7 In usual notation matrix A is idempotent matrix
- a $A = A'$.
- b $A = A^{-}$.
- c $A = A^{\perp}$.
- d Non-of-above.

8 In usual notation rank of matrix $r_{A_{mxn}}$ is
- a $r_A \geq Max(m,n)$.
- b $r_A \leq Min(m,n)$.
- c $r_A > Max(m,n)$.
- d $r_A < Min(m,n)$.

Q-2 Attempt any **SEVEN** 14

(1) In usual notation show that $A = AH$.

(P.T.O.)

1

(2) Define Nilpotent matrix.

(3) Write latent root of matrix $A = A^2$.

(4) Let latent root of matrix A be 1 or 0 or -1. Write property of matrix A.

(5) React and justify :Matrix, $A = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 4 & 10 \\ -1 & -2 & -5 \end{bmatrix}$ is 4-potent matrix.

(6) Write system of homogeneous equation.

(7) Write interpretation of dimension of vector space.

(8) In usual notation write $\sum_{i=1}^{n} X_i$ in vector and matrix notation.

(9) Write centering matrix.

Q-3 A In usual notation show that : For any matrix A_{nxm} A^- ; g-inverse of A always exist but not unique. 06

Q-3 B In usual notation prove : (1) λ^k is latent root of A^k ; $A^k \underline{u} = \lambda^k \underline{u}$ (2) $\left(\frac{1}{\lambda}\right)$ is latent root of A^{-1} for non-singular matrix A (3) $(c\lambda)$ is latent root of cA (4) $(\lambda \pm c)$ is latent root of $(A \pm cI)$ (5) $f(\lambda)$ polynomial in λ is latent root of $f(A)$ polynomial in A 06

OR

Q-3 B In usual notation prove that $X = XH$. 06

Q-4 A In usual notation discuss : ABS (Least Square Solution) of inconsistence system of equations. 06

Q-4 B In usual notation discuss Gram-Schmidt orthogonalization. 06

OR

Q-4 B In usual notation show that $P = XS^-X'$ is invariant to any choice of S^- of $S = X'X$. 06

Q-5 A In usual notation derive determinant of $(aI_n + bJ_n)$. 06

Q-5 B State and two definition of g-inverse of matrix and establish equivalence between them. 06

OR

Q-5 B In usual notation state and prove Orthogonal projection of vector. 06

Q-6 A In usual notation state prove that $r_{X'X} = r_X$. 06

Q-6 B Explain : Equation of model (model equation), normal equation with solution. 06

OR

Q-6 B Write two definition of g-inverse of matrix A and establish equivalence. 06

— X —

(2)