

Total No. of Pages : 02

Total No. of Questions : 08

PHD (Mathematical Sci.) LINEAR ALGEBRA

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT questions.
- 2. Each question carries TWENTY marks.
- □a r r 🗆 r A□_a b S Q1 a) Compute L and U for the the matrix □a b С □ □a b d 🗌 С

a, b, c, d, r, s, t to get A = LU with four pivots.

b) Find the 5 by 5 matrix A0 (h = l/6) that approximates

$$\Box \frac{d^2 u}{d \times 2} \Box f(x), \quad \frac{d u}{d \times} \Box \Box \Box \frac{d}{u} \Box \Box \Box d.$$

dxWhat is the change if the boundary conditions are changed to u(0) = l and u(1) = 0?

Q2 a) Without elimination find dimensions and bases for the Four subspaces for

□0	3	3	
A □□0	0	3	\square and \square
ρ_{\Box}	1	0	
		0	

b) Let T : R4 \square R3 be a linear transformation defined by

T(x, y, z, t) = (x - 1y + z + t, 2x - 2y + 3z + 4t, 3x - 3y + 4z + 5t). Then find a basis and dimension of image of T and Kernel of T.

- Q3 a) Use Gram-Schmidt to construct an orthonormal pair q1 and q2 from a1 = (4, 5, 2, 2) and a2 = (1, 2, 0, 0). Express a1 and a2 as a combination of q1 and q2 and find the triangular R in A = QR.
 - b) Compute y = F8c by the three steps of the Fast Fourier Transform if c = (1, 0, 1, 0, 1, 0, 1, 0, 1, 0) also repeat the computation with c = (0, 1, 0, 1, 0, 1, 0, 1).

- Q4 a) A box has edges from (0, 0, 0) to (3, 1, 1), (1, 3, 1) and (1, 1, 3). Find its volume and area of each parallelogram face.
 - b) State and prove Cramer's rule for solving system of linear equations.
- Q5 a) Find eigenvalues and general solution of differential equation :

eigenvalues of the corresponding A_{11}^{11} A_{12}^{11} and sketch the ellipse.

- b) Decide between a minimum, maximum or saddle point for the function $F = -1 + 4(ex - x) - 5x \sin y + 6y2 \text{ at } x = y = 0.$
- a) Show that for any two different vector of same length, $x \square y$, the Hquseholder transformation with v = x y gives Hx = y and Hy = x.
 - b) Discuss the iterative methods for Ax = b. Show why the iteration xk10010A0xdoes not converge for A00 $\begin{bmatrix} 1 & 2 & -1 & -1 \\ 0 & 1 & 2 \end{bmatrix}$
- Q8 a) Write the dual programme of following LPP :

Maximize z = 2x + 4y + 6t

x □ y □ 4t □12 Subject to 4 ☑ y □3t □15 x , □Ø

b) Determine the optimism strategies and value of game following pay off matrix of two player :

Q6