

## Assignment - 1

Ans 3.)

restricted isometry constant  $\rightarrow \delta_s$   
all columns of  $A \rightarrow$  unit normalized.  
 $\downarrow$   
 $m \times n$

Considering any  $x$ .

such that ~~the~~ support of  $x$  be  $s$ .

Now  $A_s$  denotes columns corresponding to indices in  $x$   
for which  $x_i \neq 0$ .

$$\text{size of } A_s = m \times s$$

$$\text{now } \|Ax\|^2 = \|A_s x_s\|^2 \leq$$

Now, consider the matrix  $A_s^T A_s$ .

By Gershgorin theorem,  $\left\{ \begin{array}{l} \text{eigen values are bounded.} \\ \text{diagonal entries} = 1 \end{array} \right.$

and max value of non-diagonal  
entries  $= u(A)$

$$\because A_s^T A_s(i, j) = \langle A^{(i)}, A^{(j)} \rangle$$

$$\therefore |\lambda - 1| \leq (s-1) u(A) \rightarrow \textcircled{1}$$

Now, by notes we know

$$\delta_s = \max \{1 - \lambda_{\min}, \lambda_{\max} - 1\}$$

$$= |\lambda - 1| \rightarrow \textcircled{2}$$

By  $\textcircled{1}$  &  $\textcircled{2}$ ,  $\boxed{\delta_s \leq u(s-1)}$