JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-I Semester (CSE/IT/ECE/CE/BT/BI)

COURSE CODE (CREDITS): 18B1WCI740 (3)   MAX. MARKS: 35

COURSE NAME: Computational Techniques and Algorithms in Engineering

COURSE INSTRUCTORS: Dr. Rakesh Kanji   MAX. TIME: 2 Hours

Note: (a)All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1.(i) Provide a procedure to compute matrix norm in terms of singular value.

(ii) Apply matrix norm to compute upper bound in relative change of solution (x) with respect to small change in system (b). Consider Ax=b.

[2+3] [CO1,CO2]

Q2. (i)What is the utility of condition number? Find out any two different kinds of norm for $\begin{bmatrix} -1 \\ -2 \\ 3 \end{bmatrix}$.

(ii)Proof $\|AB\| \leq \|A\|\ \|B\|$.

[1+2+2] [CO1,CO2]

Q3. (i) Apply power method to compute an eigen vector of $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$.

(ii) Why power method has to satisfy dominant eigen value is unique?   [4+1] [CO5]

Q4. Apply QR method to compute all eigen values of below matrix.   [5] [CO5]

$$\begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$$

Q5. Derive Gershgorin circle theorem with its use. Apply this theorem to check below matrix is applicable for power method or not or you cant conclude?   [2+3] [CO5]

$$\begin{bmatrix} 1 & 2 & 9 \\ 4 & 1 & 2 \\ 5 & 3 & 9 \end{bmatrix}$$

Q6. What is the convergence criterion of Jacobi iterative method for solving equation? Apply Jacobi iterative method on below matrix to find solution.

$$\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} X = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

[1+4] [CO6]

Q7. (i) Apply successive over relaxation method on $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} X = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ with weightage factor (ω)=0.5.

(ii) Can ω guarantee convergence faster?

[4+1] [CO6]