

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-2 EXAMINATION Apr 2019

M.Tech(CSE) II and IV Semester

COURSE CODE: 15M1WCI432

MAX. MARKS: 25

COURSE NAME: Advanced Computational Techniques in Engineering

COURSE CREDITS: 3

MAX. TIME: 90Min

Note: Use of non programmable calculator without internet is permitted. All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q.1. [10 Marks. Each part is 2 marks]

- a) Define two popular matrix norms.
- b) What is an ill conditioned system?
- c) Define the terms eigenvalues and eigenvectors of a matrix A.
- d) Show the matrix representation of a system of n first order linear differential equations in n unknowns.
- e) Describe the computational advantages of using block matrix partitioning.

Q.2. [5 marks] If $A = \begin{bmatrix} 1000 & 999 \\ 999 & 998 \end{bmatrix}$, $b = \begin{bmatrix} 1999 \\ 1997 \end{bmatrix}$, show that the linear system $A*x=b$ is ill conditioned.

Q.3. [5 marks] Solve the overdetermined system given below, and find the residue with the method of least squares.

$$\begin{bmatrix} 1 & 2 & 13 \\ 1 & -1 & -2 \\ 2 & 4 & 26 \\ 2 & 1 & 11 \\ 3 & 3 & 24 \end{bmatrix} * \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -13 \\ 2 \\ -26 \\ -11 \\ -24 \end{bmatrix}$$

Q.4. [5 marks] If A and b are perturbed to $A+dA$ and $b+db$ respectively in the linear system $A*x=b$ derive an expression for $\frac{||dx||}{||x||}$.

Also give your comments on the stability of the system.