



INTERNATIONAL ISLAMIC UNIVERSITY ISLAMABAD
DEPARTMENT OF ELECTRICAL ENGINEERING
TERMINAL EXAMINATION

COURSE NAME	Advance Engineering Mathematics	BATCH	F20
COURSE CODE	EE-501	MAX. MARKS	50
INSTRUCTOR	Prof. Dr. Abdul Jalil	TIME ALLOWED	3 Hrs (+ 3 Hrs)

Note:

- Use "Advance Engineering Mathematics_Answer_Booklet.Doc" document, read and follow the instructions given inside. Convert your file to a **single PDF** file and upload within the given time limit.
- You are required to submit the **original answer sheet** to the department as soon as university resumes for students, therefore keep the original answer sheet with you.

Fall 2020 (January 25, 2021)

Q- 1. (4 x 3 = 12)

CLO-03

a.

- i. Compute the L^1 and L^2 norm on $[0,1]$ of the functions $f_1(x) = \frac{1}{3} - x$ and $f_2(x) = x - x^2$.
- ii. Verify the triangle inequality for above two functions of part (i) using each norm.

b.

Let $\mathbf{v} = \begin{pmatrix} a \\ b \end{pmatrix}$ and $\mathbf{w} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$. Use the Cauchy-Schwarz inequality to show that

$$\left(\frac{a+b}{2}\right)^2 \leq \frac{a^2 + b^2}{2}$$

- c. Write the quadratic form $q(\mathbf{X}) = x_1^2 + x_1x_2 + 2x_2^2 - x_1x_3 + 3x_3^2$ in the form $q(\mathbf{X}) = \mathbf{X}^T \mathbf{K} \mathbf{X}$ for some symmetric matrix \mathbf{K} . Is $q(\mathbf{X})$ positive definite?
- d. Explain why $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 8 & 12 \\ 3 & 12 & 27 \end{pmatrix}$ is positive definite. If yes find its Cholesky Factorization.

Advance Engineering Mathematics Paper Solution

Camilla Rothe



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