ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER **MATHEMATICS** Time:3Hrs/Week

M-Ma3-3301 (3) **LAPLACE TRANSFORMS** Marks:100

w.e.f AK 2023-2024 (Admitted Batch) **SYLLABUS**

**Course Objectives: To enable the students to –**

**CO1:** Apply the definition of Laplace transform to transform functions from the time domain

to the Laplace domain, Utilize the linearity property of Laplace transforms. **(K3)**

**CO2:** Apply the shifting theorems and change of scale property in Laplace transforms,

Utilize Laplace transforms to find derivatives and evaluate initial and final values. **(K3)**

**CO3:** Compute Laplace transforms of integrals and functions involving multiplication

by (t) and (), Understand the Laplace transforms of special functions such as

Bessel functions, error functions, and sine/cosine integrals. **(K2 & K3)**

**CO4:** Utilize the inverse Laplace transform to transform functions back from the Laplace

domain to the time domain, Apply the shifting theorems and change of scale property

in inverse Laplace transforms. **(K3)**

**CO5:** Compute inverse Laplace transforms of derivatives and integrals, Understand the

concept of convolution and its application in inverse Laplace transforms. **(K3)**

**Course Outcomes:** **After successful completion of this course, the student will be able to**

**CO1:** Compute Laplace transforms for piecewise continuous functions, Determine the

existence of Laplace transforms for functions of exponential order. **(K3)**

**CO2:** Use Laplace transforms to analyse shifted and scaled functions, Apply the initial

value theorem and final value theorem. **(K3 & K4)**

**CO3:** Evaluate Laplace transforms involving integrals and special functions, Apply Laplace

transforms to solve problems related to Bessel functions and other special

functions. **(K3 & K5)**

**CO4:** Compute inverse Laplace transforms using partial fractions and shifting

theorems, solve problems related to inverse Laplace transforms **(K3)**

**CO5:** Evaluate inverse Laplace transforms involving derivatives and integrals, Apply the

convolution theorem and Heaviside’s expansion theorem. **(K3 & K5)**

M-Ma3-3301 (3) ::2::

**Course Content:**

**UNIT – I: LAPLACE TRANSFORMS – I**

Definition of Laplace Transform - Linearity Property - Piecewise Continuous Function - Existence of Laplace Transform - Functions of Exponential order and of Class A.

**UNIT – II: LAPLACE TRANSFORMS – II**

First Shifting Theorem, Second Shifting Theorem, Change of Scale Property, Laplace transform of the derivative of f(t), Initial value theorem and Final value theorem.

**UNIT – III: LAPLACE TRNASFORM – III**

Laplace Transform of Integrals - Multiplication by t, Multiplication by tn - division by t -Laplace transform of Bessel Function - Laplace Transform of Error Function - Laplace transform of Sine and Cosine integrals.

**UNIT – IV: INVERSE LAPLACE TRANSFORMS – I**

Definition of Inverse Laplace Transform - Linearity Property - First Shifting Theorem -Second Shifting Theorem - Change of Scale property - use of partial fractions - Examples.

**UNIT – V: INVERSE LAPLACE TRANSFORMS – II**

Inverse Laplace transforms of Derivatives - Inverse Laplace Transforms of Integrals - Multiplication by Powers of 'p' - Division by powers of 'p' - Convolution Definition -Convolution Theorem - proof and Applications - Heaviside's Expansion theorem and its applications.

**ACTIVITIES:** Seminar/ Quiz/ Assignments/ Applications of Laplace Transforms to Real life Problem /Problem Solving Sessions.

**TEXT BOOK:** LaPlace Transforms by A. R. Vasishtha, Dr. R. K. Gupta, Krishna Prakashan Media Pvt. Ltd., Meerut.

**REFERENCE BOOKS:**

1. Introduction to Applied Mathematics by Gilbert Strang, Cambridge Press

2. Laplace and Fourie’s transforms by Dr. J. K. Goyal and K.P. Guptha, Pragathi Prakashan, Meerut.

\*\* \*\* \*\*