

P. R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III B.Sc. MATHEMATICS – Semester VI (w.e.f. 2018-19)

Course (Elective VII (A)) : LAPLACE TRANSFORMS

Total Hours of Teaching-Learning : 75 @ 5 h/week

Total credits : 05

Objectives:

- To understand the concepts of Laplace Transform and Inverse Laplace Transform.
- To find the Laplace transform of some functions.

UNIT – I : Laplace Transform I

(15 hrs)

Definition of Integral Transform – Laplace Transform Linearity, Piecewise continuous Functions, Existence of Laplace Transform, Functions of Exponential order, and of Class A.

UNIT – II : Laplace Transform II

(15 hrs)

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 Transform III

(15 hrs)

Laplace Transform of Integrals – Multiplication by t , Multiplication by t^n – Division by t , Laplace Transform of Bessel's function, Laplace Transform of error function, Laplace Transform of Sine and cosine integrals.

UNIT – IV : Inverse Laplace Transform I

(15 hrs)

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

UNIT – V : Inverse Laplace Transform II

(15 hrs)

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

Prescribed Text book:

Integral Transforms by A.R.Vasishta and R.K. Gupta, Krishnaprakasan media Pvt. Ltd. Meerat.

Reference Books:

1. Integral Transforms by Dr. J. K. Goyal and K. P. Gupta, Pragati Prakashan.
2. M. D. Raisinghania Integral Transform, S. Chand & Co., New Delhi.

BLUE PRINT FOR QUESTION PAPER PATTERN

SEMESTER-VI

PAPER -VII, Elective VII (A)

UNIT	TOPIC	V.S.A.Q	S.A.Q (including choice)	E.Q (including choice)	Marks Allotted
I	Laplace Transforms - I	01	01	01	14
II	Laplace Transforms - II	01	01	02	22
III	Laplace Transforms - III	01	01	01	14
IV	Inverse Laplace Transforms - 1	01	01	02	22
V	Inverse Laplace Transforms - 2	01	01	02	22
Total		05	05	08	94

V.S.A.Q. = Very Short answer questions (1 mark)

S.A.Q. = Short answer questions (5 marks)

E.Q. = Essay questions (8 marks)

Very Short answer questions : $5 \times 1 \text{ M} = 05$

Short answer questions : $3 \times 5 \text{ M} = 15$

Essay questions : $5 \times 8 \text{ M} = 40$

Total Marks : = 60

P. R. Government College (Autonomous), Kakinada
III Year B.Sc. Degree Examinations, VI Semester - Mathematics
Course (Elective VII (A)) - LAPLACE TRANSFORMS
PAPER - VII : MODEL PAPER (W.e.f. 2019-20)

Time: 2 Hrs 30 Min

Max. Marks : 60 M

PART - I

Answer ALL the following questions. Each question carries 1 mark.

5 x 1 = 5 M

1. Define Laplace Transform.
2. Find $L[t^3 e^{-3t}]$.
3. What is the Laplace transform of $L\{\frac{\sin t}{t}\}$
4. Write the Inverse of Laplace Transform of $\frac{a}{p^2 + a^2}$.
5. If $L^{-1}\{f(p)\} = F(t)$ then what is the inverse Laplace transform of $f^{(n)}(p)$?

PART - II

Answer any THREE of the following questions. Each question carries 5 marks. 3 x 5 = 15 M

6. Find $L\{t^n\}$, n is a positive integer.
7. State and Prove first shifting theorem in Laplace Transforms.
8. Find $L\{t(3\sin 2t - 2\cos 2t)\}$
9. Find $L^{-1}\left\{\frac{3p-2}{p^2-4p+20}\right\}$.
10. Find $L^{-1}\left\{\log\left(1 + \frac{1}{p^2}\right)\right\}$.

PART - III

Answer any FIVE questions from the following by choosing at least TWO from each section. Each question carries 8 marks.

5 X 8 = 40 M

SECTION - A

11. Find $L\{F(t)\}$, where $F(t) = \begin{cases} 0 & \text{when } 0 < t < 1 \\ t & \text{when } 1 < t < 2 \\ 0 & \text{when } t > 2 \end{cases}$
12. Find $L\{\sin\sqrt{t}\}$.
13. If $L\{F(t)\} = f(p)$ then prove that $L\{F(at)\} = \frac{1}{a} f\left(\frac{p}{a}\right)$.
14. Find $L\{C_i(t)\}$

SECTION - B

15. Prove that $L^{-1}\left\{\frac{4p+5}{(p-1)^2(p+2)}\right\} = 3te^t + \frac{1}{3}e^t - \frac{1}{3}e^{-2t}$
16. Show that $L^{-1}\left\{\frac{p^2}{(p^4+4a^4)}\right\} = \frac{1}{2a}(\cosh at \cdot \sin at + \sinh at \cdot \cos at)$.
17. Apply convolution theorem to find the inverse Laplace transform of the function $\frac{1}{(p-2)(p^2+1)}$.
18. Find $L^{-1}\left\{\frac{p}{(p^2+a^2)^2}\right\}$.