

P.R.GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III B.Sc. MATHEMATICS Syllabus for V Semester, Paper IV(B)

Course (Elective II) INTEGRAL TRANSFORMS-I

Total Hours of Teaching-Learning : 45 @ 3h/week

Total credits:02

Objectives:

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

(12 hrs)

UNIT – 1 Laplace Transform I :-

Definition of - Integral Transform – Laplace Transform Linearity, Piecewise continuous Functions, Existence of Laplace Transform, Functions of Exponential order, and of Class A, First Shifting Theorem. Second Shifting Theorem, Change of Scale Property, Laplace Transform of the derivative of $f(t)$,

(11 hrs)

UNIT – 2 Laplace Transform II :-

Laplace Transform of Integrals – Multiplication by t , Multiplication by t^n – Division by t . Laplace Transform of Sine and cosine integrals.

(11 hrs)

UNIT – 3 Inverse Laplace Transform I :-

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

(11 hrs)

UNIT – 4 Inverse Laplace Transform II :-

Inverse Laplace transforms of Derivatives–Inverse Laplace Transforms of Integrals – Multiplication 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.

Sections: 1.1 to 1.13, 1.16 to 1.20, 2.1 to 2.9, 2.10 to 2.16.

Reference Books:

Integral Transforms by Dr.J.K.Goyal and K.P.Gupta, PragatiPrakashan.

M.D.Raisinghanian Integral Transform, S.Chand& Co., New Delhi.

QUESTION PAPER PATTERN, SEMESTER-V
PAPER –IV, Elective II

Module	TOPIC	V.S.A.Q	S.A.Q (including choice)	E.Q (including choice)	Marks Allotted
Module-I	Laplace Transforms - 1	02	03	02	33
	Laplace Transforms - 2	02	02	01	20
Module-II	Inverse Laplace Transforms - 1	02	03	02	33
	Inverse Laplace Transforms - 2	02	02	01	20
Total		08	10	06	

V.S.A.Q. = Very Short answer questions (1mark)
S.A.Q.= Short answer questions (5 marks)
E.Q.= Essay questions (8 marks)

Very Short answer questions : 8x1M =08
Short answer questions : 6x5M =30
Essay questions : 4x8M = 32

Total Marks: 70

P.R.GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III Year B.Sc. Degree Examinations V Semester MATHEMATICS IV
Course (Elective II) INTEGRAL TRANSFORMS-I
MODEL PAPER (W.E.F. 2016-17)

Time: 3 hours

Max marks: 70M

PART - I

Answer all the Questions. Each question carries 1 mark.

8x1=8M

1. Define Laplace Transform.
2. Prove that $F(t) = t^n$ is of exponential order as $t \rightarrow \infty$.
3. Find $L[t^3 e^{-3t}]$.
4. What is the Laplace transform of $L\{\frac{\sin t}{t}\}$
5. Define Inverse Laplace Transform.
6. Write the Inverse of Laplace Transform of $\frac{a}{p^2 + a^2}$.
7. If $L^{-1}\{f(p)\} = F(t)$ then what is the inverse Laplace transform of $f^{(n)}(p)$?
8. Write the Heavi-side's expansion formula.

PART - II

Answer any Three questions from each section. Each question carries 5 marks. 6 x5=30M

SECTION - A

9. State and Prove first shifting theorem in Laplace Transforms.
10. Evaluate $L\{F(t)\}$ if $F(t) = \begin{cases} (t-1)^2, & t > 1 \\ 0, & 0 < t < 1 \end{cases}$
11. If $L\{F(t)\} = f(p)$ then prove that $L\{F(at)\} = \frac{1}{a} f\left(\frac{p}{a}\right)$.
12. Find $L\{t(3\sin 2t - 2\cos 2t)\}$
13. Find $L\{(1 + te^{-t})^3\}$.

SECTION - B

14. Find $L^{-1} \left\{ \frac{3p-2}{p^2-4p+20} \right\}$.
15. Find $L^{-1} \left[\frac{e^{4-3p}}{(p+4)^{5/2}} \right]$.
16. Prove that $L^{-1} \left\{ \frac{2p+1}{(p+2)^2(p-1)^2} \right\} = \frac{1}{3} t(e^t - e^{-2t})$
17. Find $L^{-1} \left\{ \frac{p}{(p^2+a^2)^2} \right\}$
18. Find $L^{-1} \left\{ \log \left(1 + \frac{1}{p^2} \right) \right\}$.

PART - III

Answer any four questions by choosing at least one from each section.

4x8=32

SECTION - C

19. Find $L\{F(t)\}$, where $F(t) = \begin{cases} 0 & \text{when } 0 < t < 1 \\ t & \text{when } 1 < t < 2 \\ 0 & \text{when } t > 2 \end{cases}$
20. Find $L\{\sin\sqrt{t}\}$.
21. Find $L\{C_i(t)\}$

SECTION - D

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