

P.R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

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

Course (Cluster VIII A -1) INTEGRAL TRANSFORMS

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

Total credits:05

Objectives:

- To be able to apply Laplace transform and inverse laplacetransform to find the solution of Ordinary Linear Differential Equations and Integral Equations.
- To understand the concepts of Infinite and Finite Fourier Transforms.
- To be able to find the Fourier transform of some functions.

UNIT – I : Application of Laplace Transform to solutions of Differential Equations (15 hrs)

Solutions of Differential Equations with Constants Co-efficient, Solutions of Differential Equations with Variable Co-efficient.

UNIT – II : Application of Laplace Transform

(15 hrs)

Solution of Simultaneous Ordinary Differential Equations, Solutions of Partial Differential Equations.

UNIT – III : Application of Laplace Transforms to Integral Equations

(15 hrs)

Definitions: Integral Equations - Abel's, Integral Equation - Integral Equation of Convolution Type, Integro Differential Equations - Application of L.T. to Integral Equations.

UNIT – IV : Fourier Transforms – I

(15 hrs)

Definition of Fourier Transform – Fourier's Inverse Transform – Fourier Cosine Transform – Linear Property of Fourier Transform – Change of Scale Property for Fourier Transform – Sine Transform and Cosine Transform Shifting Property – Modulation Theorem.

UNIT – V : Fourier Transform - II

(15 hrs)

Convolution Definition – Convolution Theorem for Fourier Transform – Parseval's Indentify – Relationship Between Fourier and Laplace Transforms – Problems. related to Integral Equations.

Finite Fourier Transforms :

Finite Fourier Sine Transform – Finite Fourier Cosine Transform – Inversion Formula for Sine and Cosine Transforms only statement and related problems.

Prescribed Text book:

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

Reference Books:

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

BLUE PRINT FOR QUESTION PAPER PATTERN
SEMESTER-VI
PAPER VIII (A) 1, CLUSTER VIII (A) 1

UNIT	TOPIC	V.S. A.Q	S.A.Q (including choice)	E.Q (including choice)	Marks Allotted
I	Application of Laplace Transform to solutions of Differential Equations	01	01	02	22
II	Application of Laplace Transforms	01	01	01	14
III	Application of Laplace Transforms to Integral Equations	01	01	01	14
IV	Fourier Transforms-I	01	01	02	22
V	Fourier Transform-II	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 x 1 M = 05
Short answer questions : 3 x 5 M = 15
Essay questions : 5 x 8 M = 40

Total Marks : = 60

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P.R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III Year B.Sc. Degree Examinations VI Semester MATHEMATICS
Course (Cluster – VIII (A) -1) INTEGRAL TRANSFORMS
PAPER VIII (A) 1, MODEL PAPER (w.e.f. 2019-20)

Time: 2 hrs 30 Min

Max. Marks : 60M

PART – I

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

5 x 1 = 5 M

1. Write the formula of $L\{y''\}$.
2. Find $L\left(\frac{\partial y}{\partial x}\right)$.
3. Write the Integral equation of convolution type.
4. Write the Fourier Sine Transform of $F(x)$.
5. Find the cosine transform of $2e^{-5x}$.

PART – II

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

6. Solve $\frac{d^2y}{dx^2} + y = 0$ under the conditions that $y = 1, \frac{dy}{dx} = 0$ when $t = 0$.
7. Solve $(D^2 - 3)x - 4y = 0, x + (D^2 + 1)y = 0 \quad t > 0$
 If $x = y = Dy = 0, Dx = 2$ when $t = 0$.
8. Solve the integral equation $F(t) = e^{-t} - 2 \int_0^t \cos(t - u) F(u) du$
9. Find the Fourier Transform of $F(x) = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$.
10. Solve the integral equation $\int_0^\infty f(x) \cos \lambda x \, dx = e^{-\lambda}$.

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. Solve $(D + 1)^2 y = t$, give that $y = -3$, when $t = 0$ and $y = -1$, when $t = 1$.
12. Solve $\frac{\partial y}{\partial t} = 2 \frac{\partial^2 y}{\partial x^2}$, where $y(0, t) = 0 = y(5, t)$ and $y(x, 0) = 10 \sin 4\pi x$.
13. Solve the integral equation $\int_0^1 \frac{F(u) du}{(t-u)^{\frac{1}{3}}} = t(1+t)$.
14. Solve the integral equation $\int_0^t F(u) F(t-u) du = 16 \sin 4t$.

SECTION – B

15. Find the Fourier Cosine Transform of e^{-x^2} .
16. State and Prove Parseval's identity for Fourier Transforms.
17. Find the finite cosine transform of $f(x)$ if $f(x) = \frac{\cos k(\pi-x)}{k \sin k\pi}$.
18. Find the finite cosine transform of $(1 - \frac{x}{\pi})^2$.