A-0639

Total Pages : 3   Roll No. ....

MT–604

M.A./M.Sc. MATHEMATICS (MAMT/MSCMT)

(Integral Transforms)

3rd Semester Examination, Session December 2024

Time : 2:00 Hrs.   Max. Marks : 70

Note **:–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. *Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.*

Section–A

Long Answer Type Questions   2×19=38

Note **:–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. With the help of convolution theorem, evaluate :

$$L^{-1}\left\{\frac{1}{(s+1)(s-2)}\right\}$$

2. Solve :

   $(D + 2)^2 x = 4e^{-2t}$, $x(0) = -1$ and $x'(0) = 4$

3. Find the inverse Fourier transform of :

   $$F(a) = e^{-|a|y}$$

4. Discuss inversion formula for Mellin Transform.

5. State and prove Parseval Theorem.

Section–B

Short Answer Type Questions   4×8=32

Note :– Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Evaluate :

   $$L\{\cosh at]$$

2. Evaluate :

   $$L\{(t + 3)^2 e^t\}$$

3. Find the finite cosine transform of :

   $$\left(1-\frac{x}{\pi}\right)^2$$

4. Discuss some applications of Mellin Transform in Physics.

5. Write a short note on complex Fourier series.

6. Find the first order Henkel transform of :

$$f(r) = e^{-ar}.$$

7. Find the nth order $(n \geq 0)$ Henkel transform of :

$$f(r) = r^n H(a - r).$$

8. For Mellin transform, if $M\{f(x); p\} = F(p)$, then prove that :

$$M\{f(ax); p\} = a^{-p}F(p)$$

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