Total No. of Questions : 05] **[SET-A]** **[Total No. of Printed Page : 02**

FINAL EXAMINATION – JULY 2017

MASTER OF SCIENCE (M.Sc. MATHEMATICS)

Final Year – Third Semester

Integral Transform - I

3M.Sc. 2

Time : 3 Hours **Max Marks : 70**

Min. Marks : 25

Note :- Solve any two parts from each question. All questions carry Equal marks.

Q.1. (a) State and prove Laplace inverse convolution theorem.

(b) State and prove Laplace Heari-Side's expansion theorem.

(c) Find the Laplace transform of H(t) defined as

$H(t) = \begin{cases} t+1, & 0 \leq + \leq 2 \\ 3, & t+2 \end{cases}$, Also determine L$\{H'(t)\}$.

Q.2. (a) Using Laplace transforms. Find solution of $y'' + 25y = 10\,cos5t$, where $y(0) = 2, y'(0) = 0$.

(b) Solve $(D^2+1)x - Dy = 1$

$Dx + (D^2+2)y = 0$

With $+ > 0;\ x = 0, Dx = 0 = y = Dy$, when $t = 0, x\ and\ y$ both being function it.

(c) State and prove the application of Laplace transform to integral Savit equation.

Q.3. (a) State and prove the application of electrical circuits to Laplace transform.

(b) Solve the boundary value problem

$\frac{\partial^2 4}{\partial t^2} = a^2\ \frac{\partial^2 4}{\partial x^2}$, $(t > 0, x > 0), where\ 4(x,0) = 0, x \geq$
$0, 4t \quad (x,0) = 0, x > 0.$
$4(0,t) = t, \lim_{x\to\infty} 4(x,t) = 0, t \geq 0$

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(c) State and prove Heat Conduction equation of Laplace transform.

Q.4. (a) Obtain a Series of Sines and Cosines of multiples of x which will represent $f_{(x)}$ in the integral - $\pi < x < \pi$ when
f(x)=$\begin{cases} 0, -\pi < x \leq 0 \\ \frac{\pi x}{4}, 0 < x < \pi \end{cases}$ and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} +$ ----.

(b) State and prove Modulation theorem of Fourier transform.

(c) State and prove Fourier Integral theorem.

Q.5. (a) State and prove Parseval's identity for Fourier transform.

(b) Show that $\int_0^\infty \frac{Cos\lambda x \, dx}{\lambda^2+1} \, d\lambda = \frac{\pi}{2} e^{-x}, x \geq 0$.

(c) State and prove inversion formula of Sine Transform.

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