QP Code: **RM20MSC109** Reg. No | | | | | | | | | | | AR 20

GIET UNIVERSITY, GUNUPUR – 765022
M. Sc. (First Semester) Examinations, May – 2021
20MTPC104 – INTEGRAL TRANSFORMATIONS
(Mathematics)

Time: 2 hours Maximum: 50 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** the questions

a. Find the Laplace Trans form of $\cos^2 2t$.

b. Find the inverse Laplace transform of $\log\left(\frac{s+1}{s-1}\right)$.

c. Find the Laplace Transform of the Bessel Function $J_0(x)$.

d. Express $f(x)=\frac{x}{2}$ as a Fourier series in the interval $-\pi < x < \pi$.

e. State and Prove the Shifting Property of Fourier Transforms.

f. Using Parseval's Identity for Fourier Cosine Transforms, prove that $\int_0^\infty \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$

g. Obtain the zero-order Hankel transform of $\frac{\exp(-ar)}{r}$.

h. State and Prove the Parseval's Relation of Hankel Transforms.

i. Find the Z Transform of e^{an}.

j. State and Prove the Initial Value Theorem of Z Transforms.

PART – B **(6 x 5 = 30 Marks)**

Answer ***ANY FIVE*** questions Marks

2. Using Laplace Transforms, solve the differential equation $y'''+2y''-y'-2y=0$ given $y(0)=y'(0)=0$ and $y''(0)=6$. (6)

3. If $f(t)$ is a periodic function with period T, i.e., $f(t+T)=f(t)$, then show that $L[f(t)]=\frac{1}{1-e^{-sT}}\int_0^T e^{-st}f(t)dt$. (6)

4. State and Prove Fourier Integral Theorem. (6)

5. Find the Fourier Cosine Transform of $f(x)=\begin{cases} x, & for\ 0<x<1 \\ 2-x, & for\ 1<x<2 \\ 0, & for\ x>2 \end{cases}$ (6)

6. Derive the Hankel Transform of Derivatives. (6)

7. State and Prove the Convolution Theorem of Z Transforms. (6)

8. Using Z Transforms, solve the difference equation $u_{n+2}+4u_{n+1}+3u_n=3^n$ with $u_0=0, u_1=1$. (6)

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