


B.Sc. V Semester Degree Examination, March/April - 2023
MATHEMATICS
**Paper No. 5.1-(IX) : Integral Transforms
(CBCS)**

Time : 3 Hours

Maximum Marks : 70

Note : Answer all the Sections.
SECTION - A

Answer any five of the following.

5x2=10

1. Find $L[e^{at}]$.
2. Find $L[\cos hmt]$.
3. Evaluate $L[4t^2 - 5t + 7]$.
4. Using convolution theorem find $L^{-1}\left[\frac{1}{(s+1)(s+2)}\right]$.
5. Evaluate $L\left[\frac{\sin t}{t}\right]$.
6. If $F(s)$ is the Fourier Transform of $F(x)$ then P.T $\frac{1}{a} F\left(\frac{s}{a}\right)$ is the Fourier Transform of $F(ax)$.
7. Find the Z-transform of $(\cos \theta + i \sin \theta)^n$.

SECTION-B

Answer any five questions.

5x6=30

8. Verify convolution theorem for $f(t) = 1$, $g(t) = \sin t$.
9. Find $L^{-1}\left[\frac{4s}{(s-1)^2(s+2)}\right]$.
10. Solve the Differential Equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$. Given that $y(0) = 1$, and $y'(0) = 0$.

**P.T.O.**

11. Solve $\frac{dx}{dt} = 2x - 3y$, $\frac{dy}{dt} = y - 2x$ given $x(0) = 8$, $y(0) = 3$.
12. Obtain the Fourier Series for the function $f(x) = x^2$ in $- \pi \leq x \leq \pi$ and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$.
13. Expand the function $f(x) = x \sin x$ as a Fourier series in the interval $- \pi \leq x \leq \pi$.
14. Obtain the Half-Range sine series of the function $f(x) = x^2$ in $0 < x < \pi$.

SECTION - C

Answer any five of the following.

5x6=30

15. Find the Fourier transform of $f(x) = \begin{cases} x & |x| \leq a \\ 0 & |x| > a \end{cases}$.
16. Find the Sine and Cosine Fourier transform of $2e^{-5x} + 5e^{-2x}$.

17. Use parseval's identity to prove that $\int_0^\infty \frac{dt}{(a^2 + t^2)(b^2 + t^2)} = \frac{\pi}{2ab(a + b)}$.

18. If $Z_T(U_n) = \bar{U}(Z)$ then prove that $Z_T(U_n - k) = Z^{-k} \bar{U}(Z)$ when $k > 0$.
19. Find the Z-transform of $\sin(3n + 5)$.

20. Find Inverse Z-transform of $\left[\frac{5z}{(2-z)(3z-1)} \right]$.
21. Solve by using z-transform $y_{n+2} - 4y_n = 0$
Given that $y_0 = 0$, $y_1 = 2$.

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