



B.Sc. V - Semester Degree Examination, Nov./Dec. - 2018

MATHEMATICS

Integral Transforms

Paper - IX and (5.1)

(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

Answer all the sections.

SECTION - A

Answer any ten of the following :

(10×2=20)

1. Find the Laplace transform of m^t .
2. Find $L[e^t \sin 2t]$.
3. Find $L(2t+5)^3$.
4. Find the Inverse Laplace of $\cot^{-1}(s)$.
5. Solve $y'' + 5y = 0$ given $y(0) = 0$ & $y'(0) = 1$ by Laplace transform.

6. Determine whether $f(x)$ is even or odd function $f(x) = \begin{cases} 1 + \frac{4x}{3} & \text{in } -3/2 < x \leq 0 \\ 1 - \frac{4x}{3} & \text{in } 0 \leq x < 3/2 \end{cases}$

7. Define Fourier series.
8. Find the Fourier sine - transform of the function $f(x) = e^{-bx} + e^{-x}$.

[P.T.O]

- 9. State and prove shifting property Fourier transform.
- 10. Define z - transform and inverse z - transform.
- 11. Find the z - transform of $(\cos \theta + i \sin \theta)^n$.
- 12. If $z_T(u_n) = \bar{v}(z)$ then $z_T(k^n u_n) = \bar{u}(z/k)$.

Section - B

Answer any Five of the following :

(5×6=30)

- 13. Find the Laplace transforms of the function $t^2 e^{-2t} \cos t$.
- 14. Find $L^{-1} \left[\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6} \right]$.
- 15. Verify the convolution theorem for the function $f(t) = t$ $g(t) = \cos t$.
- 16. Solve $\frac{d^2 y}{dt^2} + 2 \frac{dy}{dt} - 3y = \sin t$ given $y(0) = y'(0) = 0$.
- 17. Solve $\frac{dx}{dt} + y = \sin t; \frac{dy}{dt} + x = \cos t$ given $x=2$ and $y=0$ for $t=0$ by using Laplace transform.
- 18. Obtain the Fourier series for the function

$$f(x) = \begin{cases} 1 + 2x/\pi & \text{in } -\pi < x \leq 0 \\ 1 - 2x/\pi & \text{in } 0 \leq x < \pi \end{cases}$$

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$

- 19. Obtain the cosine half range Fourier series for the function $f(x) = 2x-1$ in $(0,2)$.



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Section - C

Answer any Five of the following :

(5×6=30)

20. Obtain the fourier cosine transform of the function $f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4-x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$.

21. Find the fourier transform of $f(x) = e^{-|x|}$.

22. Find the Fourier sine transform of the function $f(x) = \begin{cases} x^2 & 0 < x < 1 \\ 0 & x > 1 \end{cases}$.

23. Using p on seval identity prove that $\int_0^{\infty} \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$.

24. If $\bar{u}(z) = \frac{5z^2+3z+12}{(z-1)^4}$ show that $u_2 = 5$ and $u_3 = 23$.

25. Find $Z_r^{-1} \left[\frac{8Z-Z^3}{(4-Z)^3} \right]$.

26. Solve by using z-transform $y_{n+1} + \frac{1}{4}y_n = \left(\frac{1}{4}\right)^n y_n = 0$.

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