K25U 0328

Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Mathematics (Honours) Degree
(C.B.C.S.S. – Supplementary) Examination, April 2025
(2019 – 2020 Admissions)
Core Course
BHM 601 : MATHEMATICAL TRANSFORMS

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **any 4** questions out of 5 questions. **Each** question carries **1** mark. **(4×1=4)**

1. What is the Laplace transform of f(t) = 1 ?
2. What is the inverse Laplace transform of $\frac{s}{s^2+1}$?
3. Define the Fourier sine integral.
4. What is the Mellin transform of e^{-nx} ?
5. Find the Z transform of $f(n) = a^n$, $n \geq 0$.

SECTION – B

Answer **any 6** questions out of 9 questions. **Each** question carries **2** marks. **(6×2=12)**

6. Define the unit step function.
7. Compute the inverse Laplace transform of $\frac{e^{-3s}}{s^2}$.
8. What is the Fourier cosine transform of e^{-ax}, $a > 0$?
9. Find the Fourier sine integral representation of $f(x) = \begin{cases} \sin x & \text{if } 0 < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$

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10. State the scaling and shifting properties of Mellin transform.
11. Find $M(e^{-x})$.
12. Find the Hankel transform of f(r) = 1.
13. Find Z(cos nx).
14. Find Z(n).

SECTION – C

Answer **any 8** questions out of 12 questions. **Each** question carries **4** marks. **(8×4=32)**

15. Solve the initial value problem $y'' + y' + 9y = 0$, $y(0) = 0.16$, $y'(0) = 0$.
16. Sketch the graph of the function $f(t) = t$, $(0 < t < 1)$. Represent it using unit step function and also find its Laplace transform.
17. State convolution theorem and find the inverse transform of $\frac{1}{(s-a)s}$ using convolution.
18. Find the Fourier cosine and Fourier sine transforms of $f(x) = \begin{cases} k & \text{if } 0 < x < a \\ 0 & \text{if } x > a \end{cases}$.
19. Define Fourier cosine and Sine transforms of derivatives.
20. Find the Fourier transform of $f(x) = \begin{cases} k & \text{if } 0 < x < b \\ 0 & \text{otherwise} \end{cases}$.
21. Find $M\left(x\frac{d}{dx}e^{-x}\right)$.
22. Obtain the zero-order Hankel transform of $\frac{\delta(r)}{r}$.
23. State Parseval's relation in Hankel transforms.
24. Use convolution to find the inverse Z transform of $F(z) = \frac{z(z+1)}{(z-1)^3}$.
25. Find $Z^{-1}\{\exp(1/z)\}$.
26. Find Zf(n), where $f(n) = n^2$.

SECTION – D

Answer **any 2** questions out of 4 questions. **Each** question carries **6** marks. **(2×6=12)**

27. Find the inverse transform of $\ln\left(\frac{s^2+w^2}{s^2}\right)$
28. Find the Fourier transform of $f(x) = \begin{cases} xe^{-x} & \text{if } -1 < x < 0 \\ 0 & \text{otherwise} \end{cases}$.
29. State the property of Hankel transform of derivatives and find the Hankel transform of re^{-ar}, where $a > 0$.
30. Using Z transform, find the sum of the series $\sum_{n=0}^{\infty} a^n \sin nx$.
