K25FY3592 Pages: 2 Reg No:.....
Name:.....

Third Semester FYUGP Degree (Reg) Examination November 2025

KU3DSCMAT216 - TRANSFORMS, LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS

2024 Admission onwards

Time : 2 hours Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. Explain the term fundamental period of a periodic function.
2. Is the function $\sin x$ periodic?
3. How is a homogeneous PDE defined.
4. Write down the eigen functions of the one dimensional heat equation corresponding to the eigen values $\lambda_n = \frac{cn\pi}{L}$.
5. Define mixed type partial differential equation.
6. Find Laplace transform of $f(t) = 1$.
7. Define Laplace transform.
8. State Laplace transform of the n^{th} derivative $f^{(n)}(t)$.

Section B

Answer any 4 questions. Each carry 6 marks.

9. Verify that u satisfies Poisson equation with $f(x, y)$ as indicated: $u = x^2+y^2, \quad f = 4$.
10. Solve $u_y + y^2u = 0$ where u is a function of x and y.
11. Usig d'Alembert's solution find the deflection u(x,t) of a vibrating string of unit length having fixed ends with initial velocity zero and initial deflection $x(1 - x)$.
12. Determine Laplace transform of $\cos^2(\omega t)$.
13. Derive inverse Laplace transform of $\dfrac{s+1}{s^4+9s^2}$
14. Find Laplace transform of $\cosh^2 t$ using its derivatives.

Section C

Answer any 2 questions. Each carry 14 marks.

15. Find the eigenvalues and the corresponding eigenvectors of the matrix

$$A = \begin{bmatrix} 5 & 4 & 2 \\ 0 & 1 & -1 \\ 0 & 0 & 3 \end{bmatrix}$$

16. (1a) Write the augmented matrix of the following linear system of equations:

$$\begin{cases} 10x + 4y - 2z = -4, \\ -3w - 17x + y + 2z = 2, \\ w + x + y = 6, \\ 8w - 34x + 16y - 10z = 4 \end{cases}$$

(1b) Solve the linear system of equations given above.

17. Let $f(x) = x^2$, $-1 < x < 1$, $p = 2$. Is the given function even or odd or neither even nor odd? find Fourier series of $f(x)$.