16.

Exam.Code:0906
Sub. Code: 6660

Special

1108

B.E. Second Semester

MATHS-201: Differential Equations and Transformation

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of non-programmable calculator is allowed.*

x-x-x

1. (a) Define Dirac's Delta function and find its Laplace transform.
   (b) Define even and odd functions and give examples.
   (c) Find the partial differential differential equation by elimination arbitrary constants: $z = (x-a)^2 + (y-b)^2 + 1$ where a, b are arbitrary constants.
   (d) Solve the differential equation: $(x-y)^2 \frac{dy}{dx} = a^2$.
   (e) Define Parseval's Identity and minimum sqaure error in approximating a periodic function by a trigonometric polynomial of degree N. $(5 \times 2 = 10)$

PART A

2. (a) Solve the following differential equations: (2.5+2.5)
   (i) $(x^4 + y^4)dx - xy^3 dy = 0$
   (ii) $\frac{dy}{dx} + y = e^{e^x}$
   (b) Find the general solution of the differential equation: (5)
   $$y'' - 2y' + y = x^2 e^{3x}$$

3. (a) Find the genral solution of the differential equation by method of variation of parameters: (5)
   $$y'' - 2y' + y = 3x^{3/2} e^x$$
   (b) Show that $\int_{t-0}^{\infty} \int_{u=0}^{t} \frac{e^{-t} sin(u)}{u} du\, dt = \pi/4$ (5)

4. (a) Find $L(t^2 u(t-1) + \delta(t-1))$ (4)
   (b) Find the Laplace Inverse of $\cot^{-1}(s/2)$. (4)
   (c) Find the inverse Laplace transform of $\frac{e^{-1/\sqrt{s}}}{s}$. (2)

PART B

5. (a) Is the given function even or odd? Find its Fourier series: (5)
   $$f(x) = \begin{cases} \pi e^{-x} & \text{if } -\pi < x < 0 \\ \pi e^{x} & \text{if } \quad 0 < x < \pi \end{cases}$$

P.T.O.

(b) Find the Fourier sine and cosine integral representation of the function defined as: (5)

$$f(x) = \begin{cases} x & \text{if } 0 < x < 1 \\ 0 & \text{if } \quad x > 1 \end{cases}.$$

6. (a) Find the equation of the integral surface of the differential equation: (7)

$$2y(z-3)p + (2x-z)q = y(2x-3)$$

which passes through the circle $z = 0,\ x^2 + y^2 = 2x$.

(b) Formulate the partial differential equation by eliminating arbitrary function: (3)

$$f(x^2 + y^2 + z^2, z^2 - 2xy) = 0$$

7. Find the D'Alembert's solution of one dimensional wave equation (L=length of the string with initial deflection $f(x)$ and initial velocity $g(x)$) (10)

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}, \quad c^2 = T/\rho$$

x-x-x