MTH401

Final Term Examination – Spring 2006
Time Allowed: 150 Minutes

Question No. 1   **Marks : 5**

Determine the singular points of the differential equation and classify them as regular or irregular.

$$(x^2 - 9)^2 y'' + (x+3) y' + 2y =$$

Question No. 2   **Marks : 10**

Solve the given Bernoulli equation

$$\frac{dy}{dx} + y = y^2$$

Question No. 3   **Marks : 2**

Which of the following is singular point of the equation $2xy'' + 10xy' + (x-1) y = 0$

- $x = 0$
- $x = 2$
- $x = 1$
- None of other

Question No. 4   **Marks : 10**

Find the eigen value and eigen vector of the following system of linear differential equation

$$X' = \begin{pmatrix} 6 & -12 \\ 3 & -3 \end{pmatrix} X$$

Question No. 5   **Marks : 10**

Find solution of the differential equation

$$9y'' + y = 0$$

in the form of a powers series in x.

Question No. 6   **Marks : 2**

The non-trivial solution of the system exists only when

$$\det(A - \lambda I) = 0$$

- True
- False

Question No. 7   **Marks : 2**

The form of the particular solution for the differential equation $y' - y = x^{23}e^x$ is

- $y_p = Ae^x + B_1 x + B_0$

- $y_p = (Ax + B)e^x$

- $y_p = (Ax^2 + Bx + C)e^{3x}$

- None of above

Question No. 8   **Marks : 10**

Solve the following homogeneous system of differential equations

$$\frac{dx}{dt} - 7x + \frac{dy}{dt} = 3e^t$$

$$3\frac{dx}{dt} - 2x + \frac{dy}{dt} = 2e^t$$

(Just find the general solution of the equation).

Question No. 9   **Marks : 5**

Solve the differential equation

$$y'_, - 2y' + y = 0$$

Which of the following is Legendre's Equation

- $$(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 7y = 0$$

- $$(1-x^2)\frac{d^2y}{dx^2} - 7x\frac{dy}{dx} + 35y = 0$$

- $$\frac{d}{dx}\left[(1-x^2)\frac{dy}{dx}\right] + 6y = 0$$

- *All of three equations are legendre's equation*
- *None of other*

The differential equation $(2xy^2 - 2x^3)dy + (4x^3 - 6xy^2 + 2xy^2)dx = 0$ is

- Separable
- Exact
- Linear
- Bernoulli's