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 irregula . r

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

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

$2xy'' + 10 xy' + (x - 1) y = 0$

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

Question No. 4 **Marks : 10**

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

$$X' = \begin{bmatrix} 9 & -12 \\ 3 & -3 \end{bmatrix} X$$

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 is $y'' - y = xe^{2x} - 3$

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

$y = C_p(Ax + Bx)e^{2x}$

- None of above

Question No. 8 **Marks : 10**

Solve the following homogeneous system of differential equations

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

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

(Just find the general solution of the equation).

Question No. 9 **Marks : 5**

Solve the differential equation

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

Question No. 10 **Marks : 2**

Which of the following is Legendre's Equation

- $(1-x^2)\frac{dy}{dx} - x\frac{dy}{dx} + 7y = 0$
- $(1-x^2)\frac{d^2y}{dx^2} - 7x\frac{dy}{dx} + 35y = 0$
- $\frac{d}{dx}\left((1-x)\frac{dy}{dx}\right) + 6y = 0$
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- *All of three equations are legendre's equation*
- *None of other*

Question No. 11 **Marks : 2**

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

- Separable
- Exact
- Linear
- Bernoulli's