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MTH401 FINAL TERM PAPER SUBJECTIVE 2013

**Question # 1: (2 Marks)**

Define eigenvalue of multiplicity  $m$ ?

**Question # 2: (2 Marks)**

$$A = \begin{pmatrix} 3 & 4 \\ 5 & 7 \end{pmatrix}$$

Characteristic equation of the matrix is

**Question # 3: (2 Marks)**

If the initial temperature of cooling body is  $T_0$  then write the differential equation of Newton Law of Cooling.

**Question # 4: (3 Marks)**



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$$a_2(x)y'' + a_1(x)y' + a_0(x)y = 0$$

In the equation  
no common factor.

state the conditions for ordinary and singular points if  $a_2, a_1, a_0$  are polynomials with

**Question # 5: (3 Marks)**

For the given system of differential equations

$$(D+1)x + (D-1)y = 2$$

$$3x + (D+2)y = -1$$

Write down its auxiliary equation for 'x'.

**Question # 6: (3 Marks)**

Find eigen vector of

$$\begin{pmatrix} -3 & 1 \\ 2 & -4 \end{pmatrix}$$

A= , corresponding eigen value  $\lambda = -2$ .

**Question # 7: (3 Marks)**



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Suppose that a dead body was discovered at midnight in a room when its temperature was  $85^{\circ}\text{F}$ . The temperature of the room is kept constant at  $70^{\circ}\text{F}$ . Two hours later the temperature of the body dropped to  $72^{\circ}\text{F}$ , then find the value of " $k$ " using the following solution

$$\left( \frac{dT}{dt} = k(T - 70), T(0) = 98.6 \right)$$

of the initial value problem

$$T(t) = T_m + (T_0 - T_m)e^{kt}$$

**Question # 8: (5 Marks)**

Find the Eigen values and Eigen vector of the given matrix

$$A = \begin{pmatrix} -1 & 2 \\ -7 & 8 \end{pmatrix}$$

**Question # 9: (5 Marks)**

Explain the Interval of convergence of  $\sum_{n=1}^{\infty} a_n = \sum_{n=1}^{\infty} \frac{(x-3)^n}{2^n \cdot n}$  ?

**Question # 10: (5 Marks)**

Find the eigenvalues of the following matrix.



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$$A = \begin{pmatrix} 2 & 7 \\ -1 & -6 \end{pmatrix}$$

**Question # 11: (5 Marks)**

Using Newton's Law of Cooling with initial condition  $T(0)=T_0$  and if temperatures at time  $t_1$  and  $t_2$  are known then show that

$$\frac{T(t_1) - T_m}{T(t_2) - T_m} = e^{k(t_1 - t_2)}$$