



Virtual University

About Us

MTH401
Solved Final Term Paper 1

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Year
2017

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

In the Name of Allāh, the Most Gracious, the Most Merciful

Paper Pattern

MCQS 40 each 1 mark
Short 4 each 2 marks
Short 4 each 3 marks
long 4 each 5 marks

| Question No : 1 of 52 | Marks: 1 (Budgeted Time 1 Min) |
|--|---|
| <p>The nature of the roots of the following D.E $x^2 \frac{d^2 y}{dx^2} - 5x \frac{dy}{dx} + 8y = 0$ is</p> | |
| <p>Answer (Please select your correct option)</p> | |
| <input type="radio"/> None of them | <p>WWW.VirtualAcademyLive.com</p> <p>correct Made by: Waqar Siddhu</p> |
| <input type="radio"/> real and distinct | |
| <input type="radio"/> repeated roots | |
| <input type="radio"/> complex or imaginary | |
| <p>Question No : 2 of 52</p> <p>Marks: 1 (Budgeted Time 1 Min)</p> | |
| <p>An infinite series of $(x-a)$ in the form of $c_0 + c_1(x-a) + c_2(x-a)^2 + \dots$ where the coefficients c_0, c_1, c_2, \dots and a are constants and x is a variable is called</p> | |
| <p>Answer (Please select your correct option)</p> | |
| <input type="radio"/> Real series | <p>WWW.VirtualAcademyLive.com</p> <p>correct Made by: Waqar Siddhu</p> |
| <input type="radio"/> Analytic series | |
| <input type="radio"/> Power series | |
| <input type="radio"/> None of them | |

Question No : 3 of 52

Marks: 1 (Budgeted Time 1 Min)

In the infinite series of $(x-a)$ which can be written as $\sum_{n=0}^{\infty} c_n (x-a)^n = c_0 + c_1(x-a) + c_2(x-a)^2 + \dots$ the number a is called the

Answer (Please select your correct option)

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☐ Radius of power series

☐ Centre of power series
correct
☐ Base of power series

☐ None of them

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Question No : 4 of 52

Marks: 1 (Budgeted Time 1 Min)

The given series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} (-1)^n$ is an

Answer (Please select your correct option)

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☐ Alternating series
correct
☐ Divergent series

☐ Exponential series

☐ None of them

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Question No : 5 of 52

Marks: 1 (Budgeted Time 1 Min)

Solution of the D.Equation $4y'' + y = 0$ is

Answer (Please select your correct option)

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☐ $y(x) = c_1 \cos \frac{x}{2} + c_2 \sin \frac{x}{2}$
correct
☐ $y(x) = c_1 \cos \frac{x}{2}$
☐ $y(x) = c_1 \sin \frac{x}{2}$
☐ None of them

Made by: Waqar Siddhu

Question No : 6 of 52

Marks: 1 (Budgeted Time 1 Min)

A function **f** is said to be convergent at a point **a** if it can be represented by the power series in (x-a) which has

Answer (Please select your correct option)

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☐ Negative radius of convergence

☐ Positive radius of convergence

☐ Radius of convergence equals zero.

☐ None of them
correct

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Question No : 7 of 52

Marks: 1 (Budgeted Time 1 Min)

For the equation of free damped motion $\frac{d^2x}{dt^2} + 2\lambda \frac{dx}{dt} + \omega^2 x = 0$ the roots are $m_1 = -\lambda + \sqrt{\lambda^2 - \omega^2}$ & $m_2 = -\lambda - \sqrt{\lambda^2 - \omega^2}$ If $\lambda^2 - \omega^2 = 0$ then system is said to be

Answer (Please select your correct option)

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☐ Over damped

☐ Critically damped

☐ Under damped

☐ None of them
correct

Made by: Waqar Siddhu

Question No : 8 of 52

Marks: 1 (Budgeted Time 1 Min)

The time interval between two successive maxima of $x(t) = Ae^{-\lambda t} \sin[\sqrt{\omega^2 - \lambda^2}t + \phi]$ is called

Answer (Please select your correct option)

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☐ Quasi-period

☐ Phase period

☐ Both the period

☐ None of them
correct

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Question No : 9 of 52

Marks: 1 (Budgeted Time 1 Min)

The Quasi-frequency of the solution $\mathbf{x(t)}$ of free damped motion is given by the number

Answer (Please select your correct option)

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☐ $\frac{\sqrt{\omega^2 - \lambda^2}}{2\pi}$

☐ $\frac{2\pi}{\sqrt{\omega^2 - \lambda^2}}$

correct

☐ $\sqrt{\omega^2 - \lambda^2}$

☐ None of them

Made by: Waqar Siddhu

Question No : 10 of 52

Marks: 1 (Budgeted Time 1 Min)

The given differential equation $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 4x = 0$ is

Answer (Please select your correct option)

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☐ Over dampedcorrect☐ Critically damped☐ Under damped☐ None of them

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Question No : 11 of 52

Marks: 1 (Budgeted Time 1 Min)

Which of the rule in matrices under multiplication does not hold true?

Answer (Please select your correct option)

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☐ Commutative lawcorrect☐ Associative law☐ Identity law☐ None of them

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Question No : 12 of 52

Marks: 1 (Budgeted Time 1 Min)

If $A = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 6 & 7 \end{bmatrix}$ & $B = \begin{bmatrix} x & y & z & a \\ p & q & r & b \\ l & mn & o \end{bmatrix}$ then the order of matrix $A \times B$ is

Answer (Please select your correct option)

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☐ 2×4 correct☐ 2×3 ☐ 3×3 ☐ None of them

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Question No : 13 of 52

Marks: 1 (Budgeted Time 1 Min)

The order of a matrix which contains 1 rows and m columns is

Answer (Please select your correct option)

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☐ $1 \times m$ correct☐ $2 \times m$ ☐ $m \times 1$ ☐ None of them

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Question No : 14 of 52

Marks: 1 (Budgeted Time 1 Min)

Eigen value of the matrix $A = \begin{pmatrix} 3 & 4 \\ -1 & 7 \end{pmatrix}$ is

Answer (Please select your correct option)

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☐ $\lambda = 5, 3$ ☐ $\lambda = 5, 5$ ☐ $\lambda = 3, 4$ ☐ None of themcorrect

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Question No : 15 of 52

Marks: 1 (Budgeted Time 1 Min)

The given system without the use of matrices $\frac{d}{dt} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 & -7 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 4 \\ 8 \end{pmatrix} e^{-t}$ is

Answer (Please select your correct option)

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☐ $\frac{dx}{dt} = 3x - 7y + 4 \sin 2t; \frac{dy}{dt} = x + y + 8 \cos 2t$

☐ $\frac{dx}{dt} = 3x - 7y + 4e^{-t}; \frac{dy}{dt} = x + y + 8e^{-t}$

correct

☐ $\frac{dx}{dt} = 3x - 7y + 4e^t; \frac{dy}{dt} = x + y + 8e^{-t}$

☐ None of them

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Question No : 16 of 52

Marks: 1 (Budgeted Time 1 Min)

The matrix $A = \begin{bmatrix} 3 & -18 \\ 2 & -9 \end{bmatrix}$ has an eigen value of multiplicity

Answer (Please select your correct option)

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☐ 1

☐ 2

☐ 3

correct

☐ 4

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Question No : 17 of 52

Marks: 1 (Budgeted Time 1 Min)

The matrix $A = \begin{bmatrix} 1 & -2 & -2 \\ -2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ has eigen values $\lambda = -1, -1, 5$ where $\lambda = -1$ is a

Answer (Please select your correct option)

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☐ Single root of A

☐ triple root of A

correct

☐ double root of A

☐ None of them

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Question No : 18 of 52

Marks: 1 (Budgeted Time 1 Min)

The differential equation $2\frac{dy}{dx} + x^2y = 2x + 3, y(0) = 5$ is

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ Linear☐ Nonlinear☐ Linear with fixed constants☐ Undeterminable to be linear or nonlinearcorrect**Made by: Waqar Siddhu**

Question No : 19 of 52

Marks: 1 (Budgeted Time 1 Min)

If A is a square matrix and its determinant is zero, then

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ A is singular matrix.☐ A is non singular matrix.☐ A is scalar matrix.☐ A is diagonal matrix.correct**Made by: Waqar Siddhu**

Question No : 20 of 52

Marks: 1 (Budgeted Time 1 Min)

The Differential Equation $(x^2 + 1)y'' + 2xy' + 6y = 0$ has singularity at

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ $x = \pm 1$ ☐ $x = \pm i$ ☐ $x = \pm 2$ ☐ $x = \pm 2i$ correct**Made by: Waqar Siddhu**

Question No : 21 of 52

Marks: 1 (Budgeted Time 1 Min)

The Differential Equation $(x^2 - 4)y'' - 10xy' + y = 0$ has singularity at

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com
☐ $x = \pm 1$
☐ $x = \pm 2$
correct
☐ $x = \pm 3$
☐ $x = \pm 4$
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Question No : 22 of 52

Marks: 1 (Budgeted Time 1 Min)

Any linear differential equation of the form $a_n x^n \frac{d^n y}{dx^n} + a_{n-1} x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + a_1 x \frac{dy}{dx} + a_0 y = g(x)$ where $a_0, a_1, a_2, \dots, a_n$ are constants. is called

Answer (Please select your correct option)

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☐ Homogeneous equation

☐ Polar equation

☐ Equi-dimensionanl equation

☐ None of them
correct Made by: Waqar Siddhu

Question No : 23 of 52

Marks: 1 (Budgeted Time 1 Min)

To reduce any Cauchy –Euler differential equation into a differential equation with constants coefficients we often use substitution

Answer (Please select your correct option)

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☐ $y = x^3$
☐ None of them

☐ $x = e^t$
correct
☐ $y = e^t$
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Question No : 24 of 52

Marks: 1 (Budgeted Time 1 Min)

A rectangular arrangement of numbers or functions enclosed in the square brackets is called

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ Equation☐ derterminant☐ Matrix☐ None of themcorrect**Made by: Waqar Siddhu**

Question No : 25 of 52

Marks: 1 (Budgeted Time 1 Min)

For eigen values $\lambda = 5, 5$ of a matrix $A = \begin{pmatrix} 3 & 4 \\ -1 & 7 \end{pmatrix}$, there exists eigen vectors.

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ infinite☐ one☐ two☐ threecorrect**Made by: Waqar Siddhu**

Question No : 26 of 52

Marks: 1 (Budgeted Time 1 Min)

If wroskian of the solution vectors X_1 & X_2 is zero, then vectors are

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ Linearly Independent☐ Linearly dependent☐ None of them☐ Parallelcorrect**Made by: Waqar Siddhu**

Question No : 27 of 52

Marks: 1 (Budgeted Time 1 Min)

If $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$, then eigen values are

Answer (Please select your correct option)

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☐ 1,2correct☐ 0,1☐ 0,2☐ None of them

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Question No : 28 of 52

Marks: 1 (Budgeted Time 1 Min)

Let λ be an eigen value of a non zero square matrix A. Then the equation $\det(A - \lambda I) = 0$ is called

Answer (Please select your correct option)

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☐ Trivial equation☐ Characteristics equation☐ Non-trivial equation☐ None of themcorrect

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Question No : 29 of 52

Marks: 1 (Budgeted Time 1 Min)

Given vectors $X_1 = \begin{bmatrix} 1 \\ -1 \end{bmatrix} e^{-2t}$, $X_2 = \begin{bmatrix} 3 \\ 5 \end{bmatrix} e^{6t}$ form a

Answer (Please select your correct option)

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☐ Linear set of solution of the system on $(-\infty, +\infty)$ correct☐ Fundamental set of solution of the system on $(-\infty, +\infty)$ ☐ Partial set of solution of the system on $(-\infty, +\infty)$ ☐ None of them

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Question No : 30 of 52

Marks: 1 (Budgeted Time 1 Min)

.....& are dependent variables in differential equations $\frac{dy}{dt} = 2x$, $\frac{dx}{dt} = 3y$

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ x, t☐ y, t☐ x, y☐ tcorrect

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Question No : 31 of 52

Marks: 1 (Budgeted Time 1 Min)

Eigen values of the following homogeneous system of Differential equation $\frac{dx}{dt} = x$, $\frac{dy}{dt} = 2x + 2y$ with coefficient matrix $\begin{bmatrix} 1 & 0 \\ 2 & 2 \end{bmatrix}$

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ $\lambda = 2, 2$ ☐ $\lambda = 1, 1$ ☐ None of them☐ $\lambda = 1, 2$ correct

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Question No : 32 of 52

Marks: 1 (Budgeted Time 1 Min)

The general solution of the second order differential equation contains -----

Answer (Please select your correct option)

WWW.VirtualAcademyLive.com☐ no constant☐ one constant☐ two constants☐ three constantscorrect

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Question No : 33 of 52

Marks: 1 (Budgeted Time 1 Min)

A solution obtained by giving particular values to the arbitrary constants in the General Solution of a differential equation is called a -----

Answer (Please select your correct option)

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☐ Singular solution☐ Particular solutioncorrect☐ Explicit Solution☐ None of these

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Question No : 34 of 52

Marks: 1 (Budgeted Time 1 Min)

If $\frac{dy}{dx} = e^x$, then $y = \dots\dots\dots$

Answer (Please select your correct option)

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☐ e^{-x} ☐ $e^x + C$ correct☐ $\ln x$ ☐ x

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Question No : 35 of 52

Marks: 1 (Budgeted Time 1 Min)

In a Bernoulli equation $x^3 \frac{dy}{dx} - 2xy = 3y^4$, identify $p(x)$, $q(x)$ & n respectively.

Answer (Please select your correct option)

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☐ $x^2, -2x, 4$ ☐ $-\frac{2}{x}, \frac{3}{x^2}, 4$ correct☐ $\frac{x}{-2}, \frac{3}{2x}, 4$ ☐ $-\frac{2}{x}, \frac{3}{2x}, 4$

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Question No : 36 of 52

Marks: 1 (Budgeted Time 1 Min)

A differential equation of the form $\frac{dy}{dx} = f(x, y)$ is said to be homogeneous if $f(tx, ty) = \dots$.

Answer (Please select your correct option)

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☐ $f(x, y)$ correct☐ $f(x)$ ☐ $f(y)$ ☐ C

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Question No : 37 of 52

Marks: 1 (Budgeted Time 1 Min)

Constant solution of the differential equation $\frac{dy}{dx} = \frac{y-1}{x}$ is-----.

Answer (Please select your correct option)

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☐ $y = 1$ correct☐ $y = 0$ ☐ $x = 1$ ☐ $x = 0$

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Question No : 38 of 52

Marks: 1 (Budgeted Time 1 Min)

If the tangent lines of two curves are perpendicular at their point of intersection then both the curves are-----.

Answer (Please select your correct option)

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☐ Non-intersecting curves☐ Parallel curves☐ Orthogonal curvescorrect☐ Intersecting curves

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Question No : 39 of 52

Marks: 1 (Budgeted Time 1 Min)

An isotope has half life of 20 days. The value of constant k will be.....

Answer (Please select your correct option)

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☐ $K = \frac{20}{\ln 2}$

☐ $K = -\frac{20}{\ln 2}$

☐ $K = -\frac{\ln 2}{20}$

correct

☐ $K = \frac{\ln 2}{20}$

Made by: Waqar Siddhu

Question No : 40 of 52

Marks: 1 (Budgeted Time 1 Min)

If $m^2 + 6m + 8 = (m+4)(m+2)$, then $D^2 + 6D + 8$ (D is a linear differential operator) is equivalent to _____

Answer (Please select your correct option)

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☐ $(m+4)(m+2)$

☐ $(D+4)(D+2)$

correct

☐ D^2

☐ $((D+4)(D+2))y$

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Question No : 41 of 52

Marks: 2 (Budgeted Time 4 Min)

Discuss the linearly dependence of solution vectors.

Answer (Please click here to Add Answer)

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Question No : 42 of 52

Marks: 2 (Budgeted Time 4 Min)

Is generally in matrices following laws hold or not?

- 1- Associative Law
- 2- Distributive Law
- 3- Commutative Law

Answer ([Please click here to Add Answer](#))

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Question No : 43 of 52

Marks: 2 (Budgeted Time 4 Min)

Whether or not all singular points have real numbers if not then give some example?

Answer ([Please click here to Add Answer](#))

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Question No : 44 of 52

Marks: 2 (Budgeted Time 4 Min)

Give an example of the non-linear differential equation.

Answer ([Please click here to Add Answer](#))

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Question No : 45 of 52

Marks: 3 (Budgeted Time 6 Min)

Find the radius of convergence of power series $\sum_{n=0}^{\infty} c_n (x-a)^n$?

Answer ([Please click here to Add Answer](#))

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Question No : 46 of 52

Marks: 3 (Budgeted Time 6 Min)

If a mass weighing 8lb and $k = 5 \text{ lb/ft}$ then find the amount of elongation's'.

Answer ([Please click here to Add Answer](#))

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Question No : 47 of 52

Marks: 3 (Budgeted Time 6 Min)

Write down the procedure of solution of the system of differential equations by "Operator Method".

Answer ([Please click here to Add Answer](#))

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Question No : 48 of 52

Marks: 3 (Budgeted Time 6 Min)

Write the following system in matrix form

$$\frac{dx}{dt} = -3x + 4y - 9z$$

$$\frac{dy}{dt} = 6x - y$$

$$\frac{dz}{dt} = 10x + 4y + 3z$$

Answer ([Please click here to Add Answer](#))

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Question No : 48 of 52

Marks: 3 (Budgeted Time 6 Min)

$$\frac{dx}{dt} = -3x + 4y - 9z$$

$$\frac{dy}{dt} = 6x - y$$

$$\frac{dz}{dt} = 10x + 4y + 3z$$

Answer ([Please click here to Add Answer](#))

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Question No : 49 of 52

Marks: 5 (Budgeted Time 10 Min)

Write the system $\frac{dx}{dt} = 6x + y + 6t$, $\frac{dy}{dt} = 4x + 3y - 10t + 4$ in the form of $X' = AX + F(t)$ Answer ([Please click here to Add Answer](#))

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Question No : 50 of 52

Marks: 5 (Budgeted Time 10 Min)

Find the general solution of the given differential equation on $(0, \infty)$

$$4x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + (4x^2 - 25)y = 0$$

Answer ([Please click here to Add Answer](#))

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Question No : 51 of 52

Marks: 5 (Budgeted Time 10 Min)

For solving a series solution for the differential equation $y'' + y = 0$ about $x_0 = 0$ Find the condition for the coefficients a_{n+2} and a_n (c_{n+2} and c_n).Answer ([Please click here to Add Answer](#))

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Question No : 52 of 52

Marks: 5 (Budgeted Time 10 Min)

Given that $y = c_1 e^x + c_2 e^{-x}$ is a two parameter family of solutions of the differential equation $\frac{d^2 y}{dx^2} - y = 0$ on $(-\infty, \infty)$ find a member of the family satisfying the boundary conditions

$$y(0) = 0, \quad y'(1) = 1$$

Answer ([Please click here to Add Answer](#))

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