MTH401-Diffeerential Equations

Spring 2012 FINAL Paper 25 July, 2012

BY

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40MCQs
4 Questions of 2 marks
4 Questions of 3 marks
4 Questions of 5 marks

1. The wronskin of the function $y_c = c_1 + c_2 \cos x + c_3 \sin x$ is

lineraly independent

lineraly dependent

both of the above

none of the above

2. If the auxiliary equation has two roots $m_1 = 2$ and $m_2 = 2$ then the general solution is

$y = c_1 e^{mx} + c_2 e^{mx}$

$y = (c_1 + c_2 x) e^{mx}$

$y = c_1 e^{\alpha x} + c_2 e^{\alpha x}$

$y = c_1 e^{\alpha x} \cos \beta x + c_2 e^{\alpha x} \sin \beta x$

Integarting factor if the D.E $\frac{dy}{dx} + \frac{y}{x \ln x} = \frac{3x^2}{\ln x}$ **is**

$\ln x$

$x \ln x$

$\frac{1}{\ln x}$

$\frac{1}{x}$

The integrating factor of the D.E $\frac{dy}{dx} + y \ln y = ye^x$ is

e^x

e^y

$e^{\frac{1}{x}}$

$e^{\frac{x}{y}}$

The interval of convergence for the function **secx** is

$(-\pi, +\pi)$

$(-\frac{\pi}{2}, \frac{\pi}{2})$ **correct answer**

$(\frac{\pi}{2}, \pi)$

None of them

The solution of the linear first order differential equation $\frac{dy}{dx} - 2xy = 0$ is

$y = e^{x^2}$ **Correct answer**

$y = \sum_{n=0}^{\infty} \frac{x^{2n}}{n!}$

Both $y = e^{x^2}$ & $y = \sum_{n=0}^{\infty} \frac{x^{2n}}{n!}$

None of them

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

Commutative law
Associative law
Identity law
None of them

- Any two matrices *A* and *B* are said to be equal if and only if they have the same orders and the corresponding elements of the two matrices are equal. Then which of the following is true:

A=B **AB=BA** **A≠B** **None of the given**

$$\frac{d}{dt}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 & -7 \\ 1 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 4 \\ 8 \end{pmatrix}\sin t$$

The given system without the use of matrices is

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

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

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

Suppose that $\{X_1, X_2, X_3 \ldots X_n\}$ is a set of n solutions vectors on an interval I, of a homogeneous system $X'=AX$. The set is said to be a fundamental set of solutions of the system on the interval I if the solution vectors are

Linearly dependent

Linearly independent **Correct answer**

Homogeneous

None of them

$$A=\begin{bmatrix} 3 & -18 \\ 2 & -9 \end{bmatrix}$$

The matrix has an exigent value of multiplicity

1

2

3

4

If **L** denote the linear differential operators with constant coefficients, then $L_1L_4 - L_2L_3$ represents the

$$\begin{vmatrix} L_1 & L_2 \\ L_4 & L_3 \end{vmatrix}$$

$$\begin{vmatrix} L_1 & L_3 \\ L_4 & L_2 \end{vmatrix}$$

$$\begin{vmatrix} L_1 & L_2 \\ L_3 & L_4 \end{vmatrix}$$ **Correct answer**

None of them

Any linear differential equation of the form

$$a_n x^n \frac{d^n y}{dx^n} + a_{n-1} x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \mathrm{L} \; + a_1 x \frac{dy}{dx} + a_0 y = g(x) \; where \; a_0,\; a_1,\; a_2 \ldots, a_n \text{ are constants.}$$

is called

Homogeneous equation

Polar equation

Equi-dimensioanl equation or Cauchy Euler **correct answer**

None of them

$$A=\begin{pmatrix}3 & 4\\ -1 & 7\end{pmatrix}$$

For eigen values $\lambda = 5,5$ of a matirx ,there exists ..... eigen vectors.

infinite
one
two
three

Let λ be an eigenvalue of a none zero square matrix A. Then the equation

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

is called

Trivial equation
Characteristics equation
Non-trivial equation **correct answer**
None of them

chracterstic equtaion

For $y\sin^2 x - y^2\cos x = c \ \ where \ \ y(0)=3; \ the \ value \ of \ c \ is$ ------.

9
-9
10
-10

$$M(x,\ y)\ dx + N(x,\ y)\ dy\ =\ 0$$

A differential equation is said to be an exact if -----.

$\frac{\partial M}{\partial x}=\frac{\partial N}{\partial y}$
$\frac{\partial M}{\partial y}\neq\frac{\partial N}{\partial x}$
$\frac{\partial M}{\partial y}=\frac{\partial N}{\partial x}$ **Correct answer**
$\frac{\partial M}{\partial y}=\frac{\partial N}{\partial y}$

- **What is the nature of the roots of the following D.E**

$$x^2\frac{d^2y}{dx^2}-5x\frac{dy}{dx}+8y=0$$

Repeated root

Real and distinct

Complex or imaginary

None of the above

- If E(t)=0, R $\neq 0$ Electric vibration of the circuit is called_____

Free damped oscillation
Un- damped oscillation
Over damped oscillation

None of the given

- If E(t)=0, R =0 Electric vibration of the circuit is called_____

Free damped oscillation
Un- damped oscillation
Over damped oscillation
None of the given

- The reactance and impedance both are measured in_____

Ohm

Newton

Volt

None

- Eigen value of a matrix $\begin{pmatrix} 3 & 4 \\ -1 & 7 \end{pmatrix}$

5, 5

10, 5

25, 5

None

If a matrix has 3 rows and 1columns then the given matrix is called_____

Column matrix

Row matrix

Rectangular matrix

Square matrix

- The matrix $\begin{pmatrix} 2 & 6 \\ 1 & 3 \end{pmatrix}$ is:6-6=0

Scalar matrix

Singular Matrix6-6=0

Non Singular matrix

None

The solution of the differential equation $\frac{dy}{dx}\tan x$ is_____

$y = \ln|\sec x| + c$

Sec x

Ln sec x+c

None of the given

Factorial of n =

(n+1)

n!

n+n=1

none of the above

Q1:Write down the system of differential equations **(5marks)**

$\frac{dx}{dt} = 6x + y + 6t$, $\frac{dy}{dt} = 4x + 3y - 10t + 4$

in form of $X' = AX + F(t)$

Solution:

$$X' = \begin{pmatrix} 6 & 1 \\ 4 & 3 \end{pmatrix} X + \begin{pmatrix} 6t \\ -10t + 4 \end{pmatrix}$$

Write name of 5 kinds of functions which can be differentiated (5marks)
Solution:
Linear function
Non-linear function
Homogeneous function
Non homogeneous function
Complementary function
Bessel function

$$\frac{dy}{dt} = x \, , \frac{dx}{dt} = y$$

- **Solve the system of differential equations by systematic elimination. (5Marks)**

Solution:

$\frac{dy}{dt} = x \Rightarrow Dy - x = 0$ .....(i)

$\frac{dx}{dt} = y \Rightarrow -y + Dx = 0$ .....(ii)

Operate (ii) by D, we get

$-Dy + D^2x = 0$ .....(iii)

Add (i) and (iii), we get

$Dy - x = 0$

$\underline{-Dy + D^2x = 0}$

$D^2x - x = 0$

$\left(D^2 - 1\right)x = 0$

Auxiliary equation is $m^2 - 1 = 0$

$m = \pm 1$

$\boxed{x(t) = c_1e^t + c_2e^{-t}}$

Put this in (i), we get

$Dy - \left[c_1e^t + c_2e^{-t}\right] = 0$

$Dy = c_1e^t + c_2e^{-t}$

Integrate both sides, we get

$\boxed{y(t) = c_1e^t - c_2e^{-t}}$

- **Find the eigen values of the following system** **(3Marks)**

$\frac{dx}{dt} = 10x - 7y$

$\frac{dy}{dt} = 5x + 8y$

- **Find integrating factor of** $\frac{dy}{dx} + 3x^2y = 6x^2$ **(3Marks)**

Determinant of matrix (3 Marks)

- Aik question singular point ka tha lec# 31 me se (3Marks)

Kch is trha tha

Both $x = 0$ and $x = -1$ are singular points of the differential equation

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

Because $x^2(x+1)^2 = 0$ or $x = 0, -1$

Now write the equation in the form

$$y'' + \frac{x^2 - 1}{x^2(x+1)^2}y' + \frac{2}{x^2(x+1)^2}y = 0$$

or $$y'' + \frac{x - 1}{x^2(x+1)}y' + \frac{2}{x^2(x+1)^2}y = 0$$

So $P(x) = \frac{x-1}{x^2(x+1)}$ and $Q(x) = \frac{2}{x^2(x+1)^2}$

Shows that $x = 0$ is a irregular singular point since $(x - 0)$ appears to the second powers in the denominator of $P(x)$.

Note, however, $x = -1$ is a regular singular point.

- Find order of homogenous eq obtained from non homogenous differential equation:

$y''+4y'+3y=4x^2+5$? **(2Marks)**

- **What is wronskian? (2 Marks)**
- **Solve the following Differential Equations with Variable Coefficients: (2 Marks)**

Solve $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=0$

Solution:

Suppose that $y=x^m$, then

$$\frac{dy}{dx}=mx^{m-1}\quad,\quad\frac{d^2y}{dx^2}=m(m-1)x^{m-2}$$

Now substituting in the differential equation, we get:

$$x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^2\cdot m(m-1)x^{m-2}-2x\cdot mx^{m-1}-4x^m$$

$$=x^m(m(m-1)-2m-4)$$

$$x^m(m^2-3m-4)=0 \quad \text{if } m^2-3m-4=0$$

This implies $m_1=-1, m_2=4$; roots are real and distinct.

So the solution is $y=c_1x^{-1}+c_2x^4$.

Q1.Why we use $C\neq 0$ in forbneious theorem? (2 MARKS)

Q2: Find order of homogenous equation obtained from non homogenous differential equation:

$y''+4y'+3y=4x^2+5$?? (2 MARKS)

Q3: solve differential equation

Q4: write Legendre's equation? (2 MARKS)

Q3.write following equations: (5 MARKS)

1).1st order partial differential equation

2.) .2nd order partial differential equation

3).1st order ordinary differential equation.

Q4. Write con efficient matrix for $\frac{dx}{dt}=6x+y+6t$, $\frac{dy}{dt}=4x+3y-10t+4$ (3 MARKS)

Q5:. **Find Eigen vector of**

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

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

Q5: find the eigen values for a matrix $\begin{pmatrix}3 & 9\\ 4 & -3\end{pmatrix}$? (3 MARKS)

Q6: Find a series solution for the differential equation $y''+y=0$ about $x_0=0$ such that

$a_{n+2} = -\frac{a_n}{(n+2)(n+1)} \qquad n = 0, 1, 2, \ldots$ $y(x) = \sum_{n=0}^{\infty} a_n x^n$

And (5 MARKS)

Q6: find the eigen vector for a matrix $\begin{pmatrix} 3 & 9 \\ 4 & -3 \end{pmatrix}$? **Corresponding Eigen value** $\lambda = 3 + \sqrt{3i}$ **.**

(5 MARKS)

Paper 3

2 marks

slope

frodinues ka theorum tha

matrices ke definition

determinant ko kesay nikaltay hain

determinant ko kesay nikaltay hain

3 marks:

indicial equation

dirative of matrices

exactness of differentials

system in the form ofx=ax=ft

general solution of diff eq

conversions wala jo raat ko kr rhy thy

2 kr power n wala

or harmonic motion

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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)

The conversion of Cauchy Euler equation $4x^2\frac{d^2y}{dx^2}+8x\frac{dy}{dx}+y=0$ after putting $x=e^t$ becomes

Answer (Please select your correct option)

- $(4\Delta^2-4\Delta-1)y=0$
- $(4\Delta^2+4\Delta+1)y=0$
- $(4\Delta^2+8\Delta+1)y=0$
- None of them

correct

Question No : 2 of 52 Marks: 1 (Budgeted Time 1 Min)

Consider a power series $\sum_{n=1}^{\infty}a_n=\sum_{n=1}^{\infty}(x-1)^n$ then power series clearly converges for the value of x lies in

Answer (Please select your correct option)

- 0<x<1
- 0<x<2

correct

- 0<x<3
- None of them

Question No : 3 of 52 Marks: 1 (Budgeted Time 1 Min)

Consider a power series $\sum_{n=1}^{\infty} a_n = \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} x^n$ then power series gives an inconclusive result if

Answer (Please select your correct option)

- $|x| \leq 1$
- $|x| = 1$ correct
- $|x| > 1$
- None of them

Question No : 4 of 52 Marks: 1 (Budgeted Time 1 Min)

Suppose that a power series $\sum_{n=1}^{\infty} a_n (x-a)^n$ is represented by a function "**f**"whose domain is the interval of the convergence of the power series. That function "**f**" is continuous, differentiable and integrable on

Answer (Please select your correct option)

- (a + R, a - R)
- (R -a, R + a)
- (a - R, a + R)
- None of them

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)

- $y(x) = c_1 \cos\frac{x}{2} + c_2 Sin\frac{x}{2}$
- $y(x) = c_1 \cos\frac{x}{2}$
- $y(x) = c_1 Sin\frac{x}{2}$
- None of them

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)

- Divergent series
- Convergent series
- Both of the Ist and 2nd option
- None of them

Question No : 7 of 52 Marks: 1 (Budgeted Time 1 Min)

If E(t)=0, $R \neq 0$ (E(t) is the source voltage & R is the resistance) then electric vibration of the circuit is said to be

Answer (Please select your correct option)

- Free damped oscillation

correct

- Free un-damped oscillation
- Both damped and un-damped oscillation
- None of them

Question No : 8 of 52 Marks: 1 (Budgeted Time 1 Min)

If E(t)=0, $R = 0$ (E(t) is the source voltage & R is the resistance) then electric vibration of the circuit is said to be

Answer (Please select your correct option)

- Free damped oscillation
- Free un-damped oscillation
- Both damped and un-damped oscillation
- None of them

Question No : 9 of 52 Marks: 1 (Budgeted Time 1 Min)

The Quasi-frequency of the solution **x(t)** of free damped motion is given by the number

Answer (Please select your correct option)

- $\frac{\sqrt{\omega^2 - \lambda^2}}{2\pi}$
- $\frac{2\pi}{\sqrt{\omega^2 - \lambda^2}}$ correct
- $\sqrt{\omega^2 - \lambda^2}$
- None of them

Question No : 10 of 52 Marks: 1 (Budgeted Time 1 Min)

Since $x(t) = \frac{2\sqrt{10}}{3} e^{-t} \sin[3t + 4.391]$ is the solution of $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 10x = 0$ *with* $x(0) = -2$, $x'(0) = 0$ .So the phase angle is

Answer (Please select your correct option)

- 4.193
- 4.391 correct
- 4.931
- None of them

Question No : 11 of 52 Marks: 1 (Budgeted Time 1 Min)

The standard unit for measurement of inductance is

Answer (Please select your correct option)

- Volt
- Ohms
- Henry correct
- None of them

Question No : 12 of 52 Marks: 1 (Budgeted Time 1 Min)

The second order linear differential equation $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-49)=0$ is a Bessel equation of degree

Answer (Please select your correct option)

- 5
- 6
- 7
- None of them

correct

Question No : 13 of 52 Marks: 1 (Budgeted Time 1 Min)

$J_{-\frac{2}{3}}(x)-J_{\frac{4}{3}}(x)=$

Answer (Please select your correct option)

- $2J'_{\frac{1}{3}}(x)$

correct

- $2J'_{\frac{2}{3}}(x)$
- $2J'_{\frac{4}{3}}(x)$
- None of them

Question No : 14 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)

- Commutative law

correct

- Associative law
- Identity law
- None of them

Question No : 15 of 52 Marks: 1 (Budgeted Time 1 Min)

If a matrix has 3 rows and 2 columns then the given matrix is called

Answer (Please select your correct option)

- Column matrix
- Square Matrix
- Inverse matrix
- Rectangular matrix — correct

Question No : 16 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 *matirx* $A\times B$ is

Answer (Please select your correct option)

- 2×4 — correct
- 2×3
- 3×3
- None of them

Question No : 17 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- $\frac{dx}{dt}=3x-7y+4\sin 2t\,;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\cos t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\sin t$ — correct
- None of them

Question No : 18 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)

- $\frac{dx}{dt}=3x-7y+4\sin 2t\ ;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4e^{-t};\ \frac{dy}{dt}=x+y+8e^{-t}$
- $\frac{dx}{dt}=3x-7y+4e^{t};\ \frac{dy}{dt}=x+y+8e^{-t}$
- None of them

Question No : 19 of 52 Marks: 1 (Budgeted Time 1 Min)

The coefficient matrix of the following homogeneous system of differential equation $\frac{dx}{dt}=3x+2y\ ,\ \frac{dy}{dt}=x+2y$ *is*

Answer (Please select your correct option)

- $\begin{bmatrix}3 & 2\\2 & 2\end{bmatrix}$
- $\begin{bmatrix}3 & 1\\2 & 2\end{bmatrix}$
- $\begin{bmatrix}3 & 2\\1 & 2\end{bmatrix}$
- None of them

Question No : 20 of 52 Marks: 1 (Budgeted Time 1 Min)

$\begin{vmatrix}4-\lambda & 1 & 0\\0 & 4-\lambda & 1\\0 & 0 & 4-\lambda\end{vmatrix}=0$ *gives*

Answer (Please select your correct option)

- $\lambda=4$ of multiplicity of 1
- $\lambda=4$ of multiplicity of 2
- $\lambda=4$ of multiplicity of 3

correct

- None of them

Question No : 21 of 52 Marks: 1 (Budgeted Time 1 Min)

By applying the Operator method or systematic elimination on a system of linear homogeneous or linear non-homogeneous differential equations we always get a

Answer (Please select your correct option)

- Single linear differential equation — correct
- Double linear differential equation
- Partial linear differential equation
- None of them

Question No : 22 of 52 Marks: 1 (Budgeted Time 1 Min)

For the system of differential equations $\frac{dy}{dt} = 2x$, $\frac{dx}{dt} = 3y$ the independent variable(s) is (are)

Answer (Please select your correct option)

- x, t
- y, t
- x, y
- t — correct

Question No : 23 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)

- Linear
- Nonlinear — correct
- Linear with fixed constants
- Undeterminable to be linear or nonlinear

Question No : 24 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)

- A is singular matrix.

  correct
- A is non singular matrix.
- A is scalar matrix.
- A is diagonal matrix.

Question No : 25 of 52 Marks: 1 (Budgeted Time 1 Min)

The Period of oscillator in the solution X=50Sin (20t+8.5) is

Answer (Please select your correct option)

- 0.17643
- 0.32045
- 0.31400

  correct
- 0.58000

Question No : 26 of 52 Marks: 1 (Budgeted Time 1 Min)

An electronic component of an electronic circuit that has the ability to store charge and opposes any change of voltage in the circuit is called

Answer (Please select your correct option)

- Inductor
- Resistor
- Capacitor

  correct
- None of them

Question No : 27 of 52 Marks: 1 (Budgeted Time 1 Min)

If determinant $\begin{vmatrix} D-3 & 1 \\ -1 & D-1 \end{vmatrix} = 0$, then .....

Answer (Please select your correct option)

- $D^2-4D+1=0$
- $D^2-4D+3=0$
- $D^2-4D+4=0$ correct
- None of them

Question No : 28 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)

- Equation
- derterminant
- Matrix correct
- None of them

Question No : 29 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)

- Linearly Independent
- Linearly dependent correct
- None of them
- Parallel

Question No : 30 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)

- 1,2 — correct
- 0,1
- 0,2
- None of them

Question No : 31 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)

- Trivial equation
- Characteristics equation
- Non-trivial equation — correct
- None of them

Question No : 32 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)

- $\lambda = 2, 2$
- $\lambda = 1, 1$
- None of them
- $\lambda = 1, 2$ — correct

Question No : 33 of 52 Marks: 1 (Budgeted Time 1 Min)

The equation $\frac{dy}{dx} = \frac{x(x+1)}{y(y-1)}$ is a/an ----------

Answer (Please select your correct option)

- partial differential equation.
- ordinary differential equation. **correct**
- polynomial equation.
- transcendental equation.

Question No : 34 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation $dx + (\frac{x}{y} - \sin y)\,dy = 0$ is ----------

Answer (Please select your correct option)

- Exact.
- Non-exact. **correct**
- Homogenous.
- Linear.

Question No : 35 of 52 Marks: 1 (Budgeted Time 1 Min)

If $f(x)$ and $g(x)$ are linearly dependent on I, then-----.

Answer (Please select your correct option)

- $W(f,g)(x) \neq 0$ (Wronskian) for all x in the interval I.
- $W(f,g)(x) = 0$ (Wronskian) for all x in the interval I.
- $W(f,g)(x)$ *may or may not be* zero for all x in the interval I. **correct**
- $W(f,g)(x)$ is not defined for all x in the interval I.

Question No : 36 of 52 Marks: 1 (Budgeted Time 1 Min)

If the auxiliary equation has roots $-2, -2$, then the general solution of the differential equation is_____

Answer (Please select your correct option)

- $y = c_1 e^{-2x} + c_2 e^{-2x}$
- $y = c_1 e^{-2+2x}$
- $y = c_1 e^{2x} + c_2 e^{-2x}$
- $y = (c_1 + c_2 x) e^{-2x}$ correct

Question No : 37 of 52 Marks: 1 (Budgeted Time 1 Min)

If the annihilator operator of $2x$ is D^2 and of xe^{3x} is $(D-3)^2$, then which of the following is the correct option?

Answer (Please select your correct option)

- The annihilator operator of $2x + xe^{3x}$ is $(D-3)^2$.
- The annihilator operator of $2x + xe^{3x}$ is D^2.
- The annihilator operator of $2x + xe^{3x}$ is $D^2 + (D-3)^2$.
- The annihilator operator of $2x + xe^{3x}$ is $D^2 (D-3)^2$. correct

Question No : 38 of 52 Marks: 1 (Budgeted Time 1 Min)

If $y_1 = x$ and $y_2 = xe^x$ are the first and second solution of $x^2 \frac{d^2y}{dx^2} - x(x+2)\frac{dy}{dx} + (x+2)y = 0$ on $(0, \infty)$, then which of the following is the most accurate option?

Answer (Please select your correct option)

- $y_1 = x$ and $y_2 = xe^x$ may or may not be linearly dependent.
- $y_1 = x$ and $y_2 = xe^x$ must be linearly independent. correct
- $y_1 = x$ and $y_2 = xe^x$ may or may not be linearly independent.
- $y_1 = x$ and $y_2 = xe^x$ must be linearly dependent.

Question No : 39 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

If $y_1 = xe^{-x}$ is the first solution of the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$, then which of the following is true for it?

Answer (Please select your correct option)

- Its second solution is $xe^{-x}\int \frac{2}{e^{-2x}}dx$
- Its second solution is $xe^{-x}\int \frac{2}{x^2e^{-2x}}dx$
- Its second solution is $xe^{-x}\int \frac{1}{x^2e^{-2x}}dx$
- Its second solution is $xe^{-x}\int \frac{1}{x^2}dx$ — correct

Question No : 40 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

If $x^2\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = 0$ is the particular form of $\frac{d^2y}{dx^2} + P(x)\frac{dy}{dx} + Q(x)y = 0$, then which of the following is the most accurate option?

Answer (Please select your correct option)

- $P(x) = \frac{2}{x^2}$ and $Q(x) = 0$
- $I.F = e^x$ $P(x) = -2$ and $Q(x) = x^2$
- $P(x) = \frac{-2}{x^2}$ and $Q(x) = 0$ — correct
- $P(x) = 0$ and $Q(x) = \frac{-2}{x^2}$

Question No : 41 of 52 — **Marks: 2 (Budgeted Time 4 Min)**

For differential equation $x(x-1)y'' + (3x-1)y' + y = 0$ if $y_1 = \sum_{k=0}^{\infty} x_k = 1 + x + x^2 + \ldots\ldots = \frac{1}{1-x}\ ;\ |x| < 1$ is one solution about regular singularity $x = 0$, then which method will be use to find 2nd solution?

Answer (Please click here to Add Answer)

Question No : 42 of 52 Marks: 2 (Budgeted Time 4 Min)

Discuss the linearly dependence of solution vectors.

Answer (Please click here to Add Answer)

Question No : 43 of 52 Marks: 2 (Budgeted Time 4 Min)

What is Legendre's differential equation

Answer (Please click here to Add Answer)

Question No : 44 of 52 Marks: 2 (Budgeted Time 4 Min)

If the complementary solution of the following differential equation is $c_1 \sin 2x + c_2 \cos 2x$, then what will be the general form of its particular solution:

$$\frac{d^2y}{dx^2} + 4y = \cos 2x$$

Answer (Please click here to Add Answer)

Question No : 45 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Can the power series method be directly applied if the coefficients P(x) and Q(x) for the differential equations $y'' + P(x)y' + Q(x)y = 0$ are not polynomials?
If P(x) = Sin x and Q(x) = Cos x, then how we solve it?

Answer (Please click here to Add Answer)

Question No : 46 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Write the homogenous system of differential equations

$$2\frac{dx}{dt} - 5x + \frac{dy}{dt} = 5e^{t}$$

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

Answer (Please click here to Add Answer)

Question No : 47 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Find the characteristic equation of coefficient matrix of the following system

$$\frac{dx}{dt} = -3x - 2y$$

$$\frac{dy}{dt} = 5x + 7y$$

Answer (Please click here to Add Answer)

Question No : 48 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Determine whether the following functions are linearly dependent or linearly Independent ?

$$y_1 = 9\cos(2x),\ y_2 = 2\cos^2 x - 2\sin^2 x$$

Answer (Please click here to Add Answer)

Question No : 49 of 52 — **Marks: 5 (Budgeted Time 10 Min)**

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

$$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - \frac{1}{64})y = 0$$

Answer (Please click here to Add Answer)

Question No : 50 of 52 — **Marks: 5 (Budgeted Time 10 Min)**

Find the wronskian of the Differential equation $y'''-2y''-21y'-18y = 3+4e^{-t}$ using variation of parameter and the root of the auxiliary equation is $m_1 = -3, m_2 = -1, m_3 = 6$?

Answer (Please click here to Add Answer)

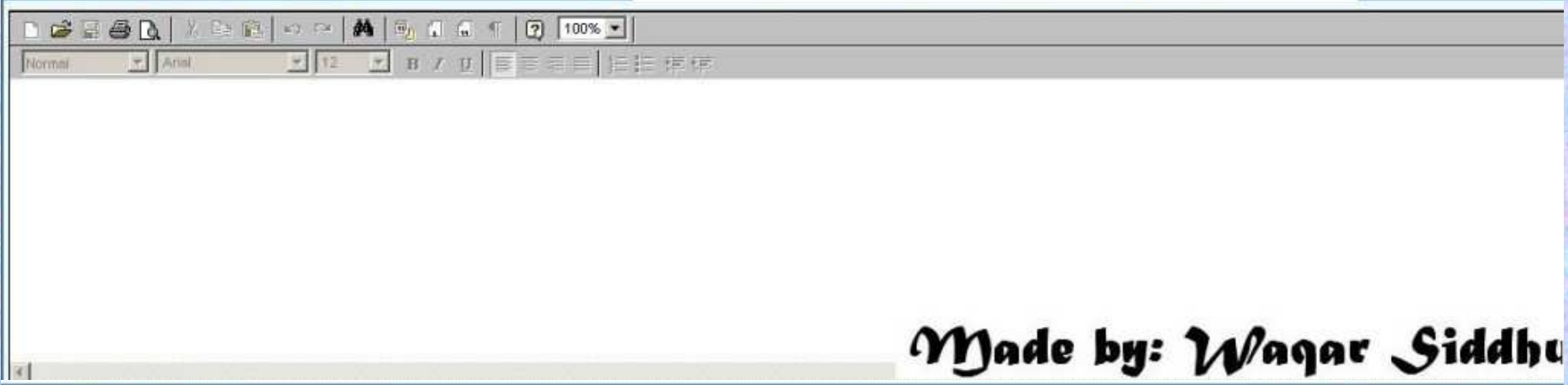
Question No : 51 of 52 **Marks: 5 (Budgeted Time 10 Min)**

Write the following system in matirx form

$$\frac{dx}{dt} = -3x + 4y + e^{-t}\sin 2t$$

$$\frac{dy}{dt} = 5x + 9y + 4e^{-t}\cos 2t$$

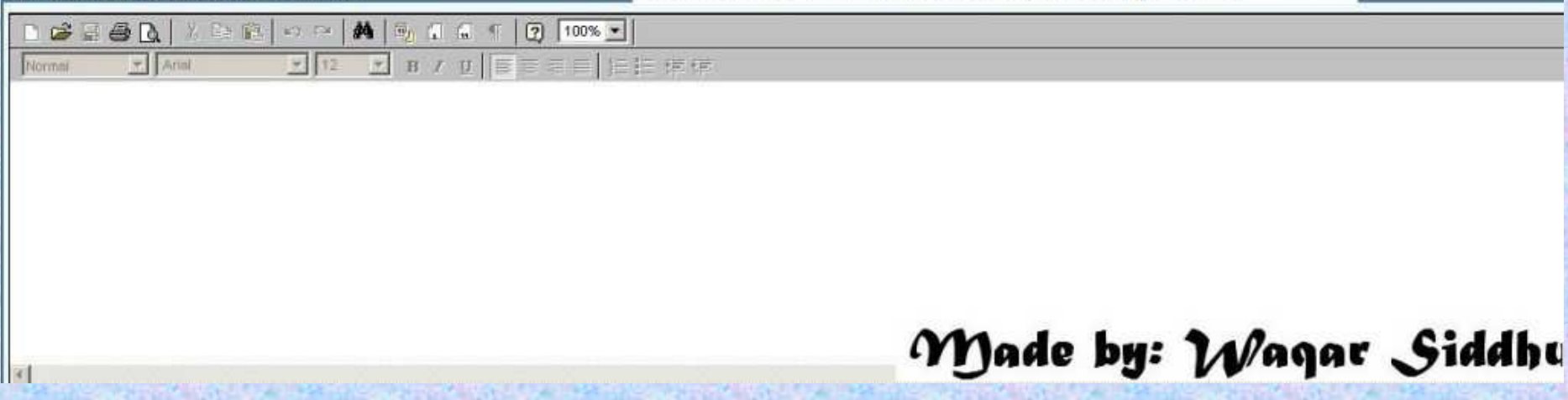
Answer (Please click here to Add Answer)



Question No : 52 of 52 **Marks: 5 (Budgeted Time 10 Min)**

As x=0 is regular singular point of the differential equation $10xy'' + 10y' - y = 0$, find the relation of C_{k+1} and C_k in the process of finding solution.

Answer (Please click here to Add Answer)



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بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِيْمِ

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)**

The conversion of Cauchy Euler equation $4x^2\frac{d^2y}{dx^2}+8x\frac{dy}{dx}+y=0$ after putting $x=e^t$ becomes

Answer (Please select your correct option)

- $(4\Delta^2-4\Delta-1)y=0$
- $(4\Delta^2+4\Delta+1)y=0$
- $(4\Delta^2+8\Delta+1)y=0$
- None of them

Question No : 2 of 52 **Marks: 1 (Budgeted Time 1 Min)**

Consider a power series $\sum_{n=1}^{\infty}a_n=\sum_{n=1}^{\infty}(x-1)^n$ then power series clearly converges for the value of x lies in

rrect option)

- $0<x<1$
- $0<x<2$
- $0<x<3$
- None of them

Question No : 3 of 52 Marks: 1 (Budgeted Time 1 Min)

Consider a power series $\sum_{n=1}^{\infty} a_n = \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} x^n$ then power series gives an inconclusive result if

Answer (Please select your correct option)

- $|x| \leq 1$
- $|x| = 1$
- $|x| > 1$
- None of them

Question No : 4 of 52 Marks: 1 (Budgeted Time 1 Min)

Suppose that a power series $\sum_{n=1}^{\infty} a_n (x-a)^n$ is represented by a function "**f**" whose domain is the interval of the convergence of the power series. That function "**f**" is continuous, differentiable and integrable on

Answer (Please select your correct option)

- (a + R, a - R)
- (R -a, R + a)
- (a - R, a + R)
- None of them

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)

- $y(x) = c_1 \cos\frac{x}{2} + c_2 Sin\frac{x}{2}$
- $y(x) = c_1 \cos\frac{x}{2}$
- $y(x) = c_1 Sin\frac{x}{2}$
- None of them

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)

- Divergent series
- Convergent series
- Both of the Ist and 2nd option
- None of them

Question No : 7 of 52 Marks: 1 (Budgeted Time 1 Min)

If E(t)=0, $R \neq 0$ (E(t) is the source voltage & R is the resistance) then electric vibration of the circuit is said to be

Answer (Please select your correct option)

- Free damped oscillation
- Free un-damped oscillation
- Both damped and un-damped oscillation
- None of them

Question No : 8 of 52 Marks: 1 (Budgeted Time 1 Min)

If E(t)=0, $R = 0$ (E(t) is the source voltage & R is the resistance) then electric vibration of the circuit is said to be

Answer (Please select your correct option)

- Free damped oscillation
- Free un-damped oscillation
- Both damped and un-damped oscillation
- None of them

Question No : 9 of 52 Marks: 1 (Budgeted Time 1 Min)

The Quasi-frequency of the solution **x(t)** of free damped motion is given by the number

Answer (Please select your correct option)

sure

- $\frac{\sqrt{\omega^2 - \lambda^2}}{2\pi}$
- $\frac{2\pi}{\sqrt{\omega^2 - \lambda^2}}$
- $\sqrt{\omega^2 - \lambda^2}$
- None of them

Question No : 10 of 52 Marks: 1 (Budgeted Time 1 Min)

Since $x(t) = \frac{2\sqrt{10}}{3} e^{-t} \sin[3t + 4.391]$ is the solution of $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 10x = 0$ *with* $x(0) = -2$, $x'(0) = 0$ .So the phase angle is

Answer (Please select your correct option)

- 4.193
- 4.391
- 4.931
- None of them

Question No : 11 of 52 Marks: 1 (Budgeted Time 1 Min)

The standard unit for measurement of inductance is

Answer (Please select your correct option)

- Volt
- Ohms
- Henry
- None of them

Question No : 12 of 52 Marks: 1 (Budgeted Time 1 Min)

The second order linear differential equation $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-49)=0$ is a Bessel equation of degree

Answer (Please select your correct option)

- 5
- 6
- 7
- None of them

Question No : 13 of 52 Marks: 1 (Budgeted Time 1 Min)

$J_{-\frac{2}{3}}(x)-J_{\frac{4}{3}}(x)=$

$$\Rightarrow 2J_n'(x)=J_{n-1}(x)-J_{n+1}(x)$$

put n=1/3

Answer (Please select your correct option)

- $2J'_{\frac{1}{3}}(x)$
- $2J'_{\frac{2}{3}}(x)$
- $2J'_{\frac{4}{3}}(x)$
- None of them

Question No : 14 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)

- Commutative law
- Associative law
- Identity law
- None of them

Question No : 15 of 52 Marks: 1 (Budgeted Time 1 Min)

If a matrix has 3 rows and 2 columns then the given matrix is called

Answer (Please select your correct option)

- Column matrix
- Square Matrix
- Inverse matrix
- Rectangular matrix

Question No : 16 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 *matirx* $A\times B$ is

Answer (Please select your correct option)

- 2×4
- 2×3
- 3×3
- None of them

Question No : 17 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- $\frac{dx}{dt}=3x-7y+4\sin 2t\,;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\cos t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\sin t$
- None of them

Question No : 18 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)

- $\frac{dx}{dt}=3x-7y+4\sin 2t\ ;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4e^{-t};\ \frac{dy}{dt}=x+y+8e^{-t}$
- $\frac{dx}{dt}=3x-7y+4e^{t};\ \frac{dy}{dt}=x+y+8e^{-t}$
- None of them

Question No : 19 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

The coefficient matrix of the following homogeneous system of differential equation $\frac{dx}{dt}=3x+2y\ ,\ \frac{dy}{dt}=x+2y$ *is*

Answer (Please select your correct option)

- $\begin{bmatrix}3 & 2\\2 & 2\end{bmatrix}$
- $\begin{bmatrix}3 & 1\\2 & 2\end{bmatrix}$
- $\begin{bmatrix}3 & 2\\1 & 2\end{bmatrix}$
- None of them

Question No : 20 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

$\begin{vmatrix}4-\lambda & 1 & 0\\0 & 4-\lambda & 1\\0 & 0 & 4-\lambda\end{vmatrix}=0$ *gives*

Answer (Please select your correct option)

- $\lambda=4$ of multiplicity of 1
- $\lambda=4$ of multiplicity of 2
- $\lambda=4$ of multiplicity of 3
- None of them

Question No : 21 of 52 Marks: 1 (Budgeted Time 1 Min)

By applying the Operator method or systematic elimination on a system of linear homogeneous or linear non-homogeneous differential equations we always get a

Answer (Please select your correct option)

- Single linear differential equation
- Double linear differential equation
- Partial linear differential equation
- None of them

Question No : 22 of 52 Marks: 1 (Budgeted Time 1 Min)

For the system of differential equations $\frac{dy}{dt} = 2x$, $\frac{dx}{dt} = 3y$ the independent variable(s) is (are)

Answer (Please select your correct option)

- x, t
- y, t
- x, y
- t

Question No : 23 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)

- Linear
- Nonlinear
- Linear with fixed constants
- Undeterminable to be linear or nonlinear

Question No : 24 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)

- A is singular matrix.
- A is non singular matrix.
- A is scalar matrix.
- A is diagonal matrix.

Question No : 25 of 52 Marks: 1 (Budgeted Time 1 Min)

The Period of oscillator in the solution X=50Sin (20t+8.5) is

Answer (Please select your correct option)

- 0.17643
- 0.32045
- 0.31400
- 0.58000

Question No : 26 of 52 Marks: 1 (Budgeted Time 1 Min)

An electronic component of an electronic circuit that has the ability to store charge and opposes any change of voltage in the circuit is called

Answer (Please select your correct option)

- Inductor
- Resistor
- Capacitor
- None of them

Question No : 27 of 52 Marks: 1 (Budgeted Time 1 Min)

If determinant $\begin{vmatrix} D-3 & 1 \\ -1 & D-1 \end{vmatrix} = 0$, then .....

Answer (Please select your correct option)

- $D^2 - 4D + 1 = 0$
- $D^2 - 4D + 3 = 0$
- $D^2 - 4D + 4 = 0$
- None of them

Question No : 28 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)

- Equation
- derterminant
- Matrix
- None of them

Question No : 29 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)

- Linearly Independent
- Linearly dependent
- None of them
- Parallel

Question No : 30 of 52 Marks: 1 (Budgeted Time 1 Min)

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

1-a(2-a)=2-a-2a+a^2

a^2-3a+2=0

a^2-2a-a+2=0

a(a-2)-1(a-2)=0

a=1,2

Answer (Please select your correct option)

- 1,2
- 0,1
- 0,2
- None of them

Question No : 31 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)

- Trivial equation
- Characteristics equation
- Non-trivial equation
- None of them

Question No : 32 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)

- $\lambda = 2, 2$
- $\lambda = 1, 1$
- None of them
- $\lambda = 1, 2$

Question No : 33 of 52 Marks: 1 (Budgeted Time 1 Min)

The equation $\frac{dy}{dx} = \frac{x(x+1)}{y(y-1)}$ is a/an ----------

Answer (Please select your correct option)

- partial differential equation.
- ordinary differential equation.
- polynomial equation.
- transcendental equation.

Question No : 34 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation $dx + (\frac{x}{y} - \sin y)\,dy = 0$ is ----------

Answer (Please select your correct option)

- Exact.
- Non-exact.
- Homogenous.
- Linear.

Question No : 35 of 52 Marks: 1 (Budgeted Time 1 Min)

If $f(x)$ and $g(x)$ are linearly dependent on I, then-----.

Answer (Please select your correct option)

- $W(f,g)(x) \neq 0$ (Wronskian) for all x in the interval I.
- $W(f,g)(x) = 0$ (Wronskian) for all x in the interval I.
- $W(f,g)(x)$ *may or may not be* zero for all x in the interval I.
- $W(f,g)(x)$ is not defined for all x in the interval I.

Question No : 36 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

If the auxiliary equation has roots $-2, -2$, then the general solution of the differential equation is_____

Answer (Please select your correct option)

- $y = c_1 e^{-2x} + c_2 e^{-2x}$
- $y = c_1 e^{-2+2x}$
- $y = c_1 e^{2x} + c_2 e^{-2x}$
- $y = (c_1 + c_2 x) e^{-2x}$

Question No : 37 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

If the annihilator operator of $2x$ is D^2 and of xe^{3x} is $(D-3)^2$, then which of the following is the correct option?

- The annihilator operator of $2x + xe^{3x}$ is $(D-3)^2$.
- The annihilator operator of $2x + xe^{3x}$ is D^2.
- The annihilator operator of $2x + xe^{3x}$ is $D^2 + (D-3)^2$.
- The annihilator operator of $2x + xe^{3x}$ is $D^2 (D-3)^2$.

Question No : 38 of 52 — **Marks: 1 (Budgeted Time 1 Min)**

If $y_1 = x$ and $y_2 = xe^x$ are the first and second solution of $x^2 \frac{d^2y}{dx^2} - x(x+2)\frac{dy}{dx} + (x+2)y = 0$ on $(0, \infty)$, then which of the following is the most accurate option?

Answer (Please select your correct option)

- $y_1 = x$ and $y_2 = xe^x$ may or may not be linearly dependent.
- $y_1 = x$ and $y_2 = xe^x$ must be linearly independent.
- $y_1 = x$ and $y_2 = xe^x$ may or may not be linearly independent.
- $y_1 = x$ and $y_2 = xe^x$ must be linearly dependent.

Question No : 39 of 52 Marks: 1 (Budgeted Time 1 Min)

If $y_1 = xe^{-x}$ is the first solution of the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$, then which of the following is true for it?

Answer (Please select your correct option)

- Its second solution is $xe^{-x}\int \frac{2}{e^{-2x}}dx$
- Its second solution is $xe^{-x}\int \frac{2}{x^2e^{-2x}}dx$
- Its second solution is $xe^{-x}\int \frac{1}{x^2e^{-2x}}dx$
- Its second solution is $xe^{-x}\int \frac{1}{x^2}dx$

$y_2 = y_1(x)\int \frac{e^{-\int P dx}}{y_1^2}dx$

Question No : 40 of 52 Marks: 1 (Budgeted Time 1 Min)

If $x^2\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = 0$ is the particular form of $\frac{d^2y}{dx^2} + P(x)\frac{dy}{dx} + Q(x)y = 0$, then which of the following is the most accurate option?

Answer (Please select your correct option)

- $P(x) = \frac{2}{x^2}$ and $Q(x) = 0$
- $I.F = e^x$ $P(x) = -2$ and $Q(x) = x^2$
- $P(x) = \frac{-2}{x^2}$ and $Q(x) = 0$
- $P(x) = 0$ and $Q(x) = \frac{-2}{x^2}$

Question No : 41 of 52 Marks: 2 (Budgeted Time 4 Min)

For differential equation $x(x-1)y'' + (3x-1)y' + y = 0$ if $y_1 = \sum_{k=0}^{\infty} x_k = 1 + x + x^2 + \ldots\ldots = \frac{1}{1-x}; |x| < 1$ is one solution about regular singularity $x = 0$, then which method will be use to find 2nd solution?

Answer (Please click here to Add Answer)

frobenius, i think and .

$y_2 = y_1(x)\int \frac{e^{-\int P dx}}{y_1^2}dx$

Question No : 42 of 52 Marks: 2 (Budgeted Time 4 Min)

Discuss the linearly dependence of solution vectors.

Answer (Please click here to Add Answer)

Any two solution vectors X1 and X2 are linearly dependent if and only if one of the two vectors is a constant multiple of the other.

Question No : 43 of 52 Marks: 2 (Budgeted Time 4 Min)

What is Legendre's differential equation

An

Lecture 34

Legendre's Differential Equation

A second order linear differential equation of the form

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

is called Legendre's differential equation and any of its solution is called Legendre's function. If n is positive integer then the solution of Legendre's differential equation is called a Legendere's polynomial of degree n and is denoted by $P_n(x)$.

We assume a solution of the form $y=\sum_{k=0}^{\infty} C_k x_k$

$\therefore (1-x^2)y''-2xy'+n(n+1)y=$

Question No : 44 of 52 Marks: 2 (Budgeted Time 4 Min)

If the complementary solution of the following differential equation is $c_1 \sin 2x + c_2 \cos 2x$, then what will be the general form of its particular solution:

$$\frac{d^2y}{dx^2} + 4y = \cos 2x$$

Answer (Please click here to Add Answer)

yp=Asin2x+Bcos2x

Question No : 45 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Can the power series method be directly applied if the coefficients P(x) and Q(x) for the differential equations $y'' + P(x)y' + Q(x)y = 0$ are not polynomials?
If P(x) = Sin x and Q(x) = Cos x, then how we solve it?

Answer (Please click here to Add Answer)

Question No : 46 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Write the homogenous system of differential equations

$$2\frac{dx}{dt} - 5x + \frac{dy}{dt} = 5e^{t}$$

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

Answer (Please click here to Add Answer)

$$(2D-5)x + Dy = 5e^{t}$$

$$(D-1)x + Dy = e^{t}$$

Question No : 47 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Find the characteristic equation of coefficient matrix of the following system

$$\frac{dx}{dt} = -3x - 2y$$

$$\frac{dy}{dt} = 5x + 7y$$

Answer (Please click here to Add Answer)

$$\begin{vmatrix} -3-\lambda & -2 \\ 5 & 7-\lambda \end{vmatrix} = -21 + 3\lambda - 7\lambda + \lambda^2 + 10$$

$$\lambda^2 - 4\lambda - 11 = 0$$

$$\lambda = \frac{4 \pm \sqrt{16 - 4(-11)}}{2} = \frac{4 \pm \sqrt{60}}{2}$$

Question No : 48 of 52 — **Marks: 3 (Budgeted Time 6 Min)**

Determine whether the following functions are linearly dependent or linearly Independent ?

$$y_1 = 9\cos(2x),\ y_2 = 2\cos^2 x - 2\sin^2 x$$

Answer (Please click here to Add Answer)

$$\begin{vmatrix} 9\cos 2x & 2(\cos^2 x - \sin^2 x) \\ -18\sin 2x & 2(2\cos x(-\sin x) - 2\sin x(\cos x)) \end{vmatrix}$$

$$\begin{vmatrix} 9\cos 2x & 2(\cos^2 x - \sin^2 x) \\ -18\sin 2x & -4\cos x(\sin x) - 4\sin x(\cos x)) \end{vmatrix}$$

$$\begin{vmatrix} 9\cos 2x & 2(\cos^2 x - \sin^2 x) \\ -18\sin 2x & -8\cos x(\sin x) \end{vmatrix}$$

$$-8\cos x(\sin x)[9\cos 2x] + 18\sin 2x[\ 2(\cos^2 x - \sin^2 x)]$$

independent

Question No : 49 of 52 — **Marks: 5 (Budgeted Time 10 Min)**

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

$$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - \frac{1}{64})y = 0$$

Answer (Please click here to Add Answer)

$$v^2 = \frac{1}{64}$$

$$v = \pm\frac{1}{8}$$

$$y = C_1 j_{1/8}(x) + C_2 j_{-1/8}(x)$$

Question No : 50 of 52 — **Marks: 5 (Budgeted Time 10 Min)**

Find the wronskian of the Differential equation $y''' - 2y'' - 21y' - 18y = 3 + 4e^{-t}$ using variation of parameter and the root of the auxiliary equation is $m_1 = -3, m_2 = -1, m_3 = 6$?

Answer (Please click here to Add Answer)

$$w = \begin{vmatrix} e^{-3t} & e^{-t} & e^{6t} \\ -3e^{-3t} & -e^{-t} & 6e^{6t} \\ 9e^{-3t} & e^{-t} & 36e^{6t} \end{vmatrix}$$

also find w1,w2,w3

$$w1 = \begin{vmatrix} 0 & e^{-t} & e^{6t} \\ 0 & -e^{-t} & 6e^{6t} \\ 3+4e^{-t} & e^{-t} & 36e^{6t} \end{vmatrix}$$

$$w2 = \begin{vmatrix} e^{-3t} & 0 & e^{6t} \\ -3e^{-3t} & 0 & 6e^{6t} \\ 9e^{-3t} & 3+4e^{-t} & 36e^{6t} \end{vmatrix}$$

$$w3 = \begin{vmatrix} e^{-3t} & e^{-t} & 0 \\ -3e^{-3t} & -e^{-t} & 0 \end{vmatrix}$$

Question No : 51 of 52 **Marks: 5 (Budgeted Time 10 Min)**

Write the following system in matirx form

$$\frac{dx}{dt} = -3x + 4y + e^{-t}\sin 2t$$

$$\frac{dy}{dt} = 5x + 9y + 4e^{-t}\cos 2t$$

Answer (Please click here to Add Answer)

$$\begin{bmatrix} \frac{dx}{dt} \\ \frac{dy}{dt} \end{bmatrix} = \begin{bmatrix} -3 & 4 \\ 5 & 9 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} \sin 2t \\ 4\cos 2t \end{bmatrix} e^{-t}$$

Question No : 52 of 52 **Marks: 5 (Budgeted Time 10 Min)**

As x=0 is regular singular point of the differential equation $10xy'' + 10y' - y = 0$, find the relation of C_{k+1} and C_k in the process of finding solution.

Answer (Please click here to Add Answer)

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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)

The solution of $x^2 \frac{d^2y}{dx^2} = 0$ is

Answer (Please select your correct option)

- $y = c_1 + c_2 x$ not sure
- $y = c_1 x + c_2 x^2$
- $y = c_1 x + c_2 x^3$
- None of them

Question No : 2 of 52 Marks: 1 (Budgeted Time 1 Min)

The nature of roots of auxiliary equation deduced from Cauchy Euler equation

$4x^2 \frac{d^2y}{dx^2} + 8x \frac{dy}{dx} + y = 0$

Answer (Please select your correct option)

- Real and unequal
- Real and repeated
- Complex
- None of them

Question No : 3 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)

- Positive radius of convergence

not sure

lecr 30, line 1..

- Radius of convergence equals zero.
- None of them
- Negative radius of convergence

Question No : 4 of 52 Marks: 1 (Budgeted Time 1 Min)

If E(t)=0, $R \neq 0$ (E(t) is thesource voltage & R is the resistance) then electric vibration of the circuit is said to be

Answer (Please select your correct option)

- Free damped oscillation
- Free un-damped oscillation
- Both damped and un-damped oscillation
- None of them

Question No : 5 of 52 Marks: 1 (Budgeted Time 1 Min)

The quantity $Z = \sqrt{X^2 + R^2}$ is called

Answer (Please select your correct option)

- Reactance of circuit
- Impedance of circuit

lecr 25

- Quasi of circuit
- None of them

Question No : 6 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- None of them
- Both the period
- Quasi-period
- Phase period

Question No : 7 of 52 Marks: 1 (Budgeted Time 1 Min)

The Quasi-frequency of the solution **x(t)** of free damped motion is given by the number

Answer (Please select your correct option)

- $\frac{\sqrt{\omega^2 - \lambda^2}}{2\pi}$
- $\frac{2\pi}{\sqrt{\omega^2 - \lambda^2}}$
- $\sqrt{\omega^2 - \lambda^2}$
- None of them

Question No : 8 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 $m_1 = -\lambda + \sqrt{\lambda^2 - \omega^2}$ & $m_1 = -\lambda - \sqrt{\lambda^2 - \omega^2}$ If $\lambda^2 - \omega^2 < 0$ then system is said to be

Answer (Please select your correct option)

- Over damped
- Critically damped
- Under damped
- None of them

Question No : 9 of 52 Marks: 1 (Budgeted Time 1 Min)

The general solution of the equation $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-\frac{1}{25})=0$ is

Answer (Please select your correct option)

- $y=c_1J_{\frac{1}{3}}(x)+c_2J_{-\frac{1}{3}}(x)$
- $y=c_1J_{\frac{1}{4}}(x)+c_2J_{-\frac{1}{4}}(x)$
- $y=c_1J_{\frac{1}{3}}(x)+c_2J_{-\frac{1}{3}}(x)$
- $y=c_1J_{\frac{1}{25}}(x)+c_2J_{-\frac{1}{25}}(x)$

Question No : 10 of 52 Marks: 1 (Budgeted Time 1 Min)

$J_{-\frac{2}{3}}(x)-J_{\frac{4}{3}}(x)=$

Answer (Please select your correct option)

- $2J'_{\frac{1}{3}}(x)$
- $2J'_{\frac{2}{3}}(x)$
- $2J'_{\frac{4}{3}}(x)$
- None of them

Question No : 11 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 *matirx* $A\times B$ is

Answer (Please select your correct option)

- 2×4
- 2×3
- 3×3
- None of them

Question No : 12 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)

- $1\times m$
- $2\times m$
- $m\times 1$
- None of them

Question No : 13 of 52 Marks: 1 (Budgeted Time 1 Min)

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

3-a(7-a)+4=0
21-3a-7a+a^2+4=0
a^2-10a+25=0
(a-5)^2=0

Answer (Please select your correct option)

- $\lambda = 5,3$
- $\lambda = 5,5$
- $\lambda = 3,4$
- None of them

Question No : 14 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- $\frac{dx}{dt}=3x-7y+4\sin 2t\,;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\cos t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\sin t$
- None of them

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)

- $\frac{dx}{dt} = 3x - 7y + 4\sin 2t\,;\ \frac{dy}{dt} = x + y + 8\cos 2t$
- $\frac{dx}{dt} = 3x - 7y + 4e^{-t};\ \frac{dy}{dt} = x + y + 8e^{-t}$
- $\frac{dx}{dt} = 3x - 7y + 4e^{t};\ \frac{dy}{dt} = x + y + 8e^{-t}$
- None of them

Question No : 16 of 52 Marks: 1 (Budgeted Time 1 Min)

The coefficient matrix of the following homogeneous system of differential equation $\frac{dx}{dt} = 3x + 2y\ ,\ \frac{dy}{dt} = x + 2y$ is

Answer (Please select your correct option)

- $\begin{bmatrix} 3 & 2 \\ 2 & 2 \end{bmatrix}$
- $\begin{bmatrix} 3 & 1 \\ 2 & 2 \end{bmatrix}$
- $\begin{bmatrix} 3 & 2 \\ 1 & 2 \end{bmatrix}$
- None of them

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)

- Single root of A
- triple root of A
- double root of A
- None of them

i think.. becz mul of -1

Question No : 18 of 52 Marks: 1 (Budgeted Time 1 Min)

By applying the Operator method or systematic elimination on a system of linear homogeneous or linear non-homogeneous differential equations we always get a

Answer (Please select your correct option)

- Single linear differential equation
- Double linear differential equation
- Partial linear differential equation
- None of them

Question No : 19 of 52 Marks: 1 (Budgeted Time 1 Min)

If **L** denote the linear differential operators with constant coefficients, then $L_1L_4 - L_2L_3$ represents the

Answer (Please select your correct option)

- $\begin{vmatrix} L_1 & L_2 \\ L_4 & L_3 \end{vmatrix}$
- $\begin{vmatrix} L_1 & L_3 \\ L_4 & L_2 \end{vmatrix}$
- $\begin{vmatrix} L_1 & L_2 \\ L_3 & L_4 \end{vmatrix}$
- None of them

Question No : 20 of 52 Marks: 1 (Budgeted Time 1 Min)

The matrix $\begin{bmatrix} 2 & 6 \\ 1 & 3 \end{bmatrix}$ is

Answer (Please select your correct option)

- Singular matrix
- Non singular matrix
- Diagonal matrix
- Scalar Matrix

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)

- $x=\pm1$
- $x=\pm2$
- $x=\pm3$
- $x=\pm4$

Question No : 22 of 52 Marks: 1 (Budgeted Time 1 Min)

Operator method is the method of the solution of a system of linear homogeneous or linear non-homogeneous differential equations which is based on the process of systematic elimination of the

Systematic Elimination: Operator Method

- This method of solution of a system of linear homogeneous or linear non-homogenec elimination
- This elimination provides us a single differential equation in one of the dependent variables that has not been eliminated.
- This equation would be a linear homogeneous or a linear non-homogeneous differential equation and can be solved by employing one of the methods discussed earlier to obtain one of the dependent variables.

Notice that the analogue of multiplying an algebraic equation by a constant is operating on a differential equation with some combination of derivatives.

Answer (Please select your correct option)

- Dependent variables
- Independent variable
- Choice variable
- None of them

Question No : 23 of 52 Marks: 1 (Budgeted Time 1 Min)

The non-zero solution of the system exists only when

non-zero vs non trivial

Answer (Please select your correct option)

- $\det(A-\lambda I)=1$
- $\det(A-\lambda I)=0$
- $\det(A-\lambda I)=-1$
- $\det(A-\lambda I)\neq 0$

The Non-trivial solution

The non-trivial solution of the system exists only when

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

This equation is called the characteristic equation of the matrix A. Thus the Eigenvalues of the matrix A are given by the roots of the characteristic equation. To find an eigenvector corresponding to an eigenvalue λ we simply solve the system of linear algebraic equations

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

Question No : 24 of 52 Marks: 1 (Budgeted Time 1 Min)

The solution of the linear first order differential equation $\frac{dy}{dx} - 2y = 0$ is

Answer (Please select your correct option)

- $y = e^{2x+c}$
- $y = \sum_{n=0}^{\infty} \frac{x^n}{4n!}$
- Both 1) and 2)
- None of them

Question No : 25 of 52 Marks: 1 (Budgeted Time 1 Min)

Ordinary points of $(x^2-64)(x^2-36)y'' + xy' - y = 0$ are

Answer (Please select your correct option)

- 0,1
- 8,-8
- 6,-6
- None of others.

Question No : 26 of 52 Marks: 1 (Budgeted Time 1 Min)

Ir-regular singular point **of** the equation $(x^2-4)^2 y'' + (x-2)y' + y = 0$ is

Answer (Please select your correct option)

- x = 2
- x = -2
- x= -2, 2
- None of them

Question No : 27 of 52 Marks: 1 (Budgeted Time 1 Min)

The matrix $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ has .....

Answer (Please select your correct option)

- Real and unequal value
- Repeated & real eigen value
- Complex eigen value
- None of them

Question No : 28 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)

- 1,2
- 0,1
- 0,2
- None of them

Question No : 29 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)

- Trivial equation
- Characteristics equation
- Non-trivial equation
- None of them

Question No : 30 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)

- $\lambda = 1, 2$
- $\lambda = 2, 2$
- $\lambda = 1, 1$
- None of them

Question No : 31 of 52 Marks: 1 (Budgeted Time 1 Min)

Which of the following may not be considered as integration technique

Answer (Please select your correct option)

- By Parts
- By substitutions
- By Partial Fractions
- None of these

Question No : 32 of 52 Marks: 1 (Budgeted Time 1 Min)

Which of the following equations satisfy the differential equation $\frac{dy}{dx} = x$

Answer (Please select your correct option)

- $2y = x^2 + c$
- $y = x^2 + c$
- $y = x^2$
- $y = x + c$

Question No : 33 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation $(3x^2y + 2)\,dx + (x^3 + y)\,dy = 0$ is -------.

Answer (Please select your correct option)

- Exact
- Non-exact
- Separable
- Homogenous

Question No : 34 of 52 Marks: 1 (Budgeted Time 1 Min)

In order to change the Bernoulli Equation

$\frac{dy}{dx} + p(x)y = q(x)y^n$

into linear differential equation, we choose ----.

Answer (Please select your correct option)

- $v = y^{n-1}$
- $v = y^{1-n}$
- $v = y^n$
- $v = y'$

Question No : 35 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 $f(tx,ty) =$ ----.

Answer (Please select your correct option)

- $f(x,y)$
- $f(x)$
- $f(y)$
- c

Question No : 36 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation ---------- is separable.

Answer (Please select your correct option)

- $x(x+y)\frac{dy}{dx}=4$
- $\frac{dy}{dx}=\frac{x^2}{x+xy}$
- $\frac{dy}{dx}=\frac{y}{1+xy^3}$
- $\frac{dy}{dx}=\frac{xy+3}{1+2xy}$

Question No : 37 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation ---------- is not separable.

Answer (Please select your correct option)

- $\frac{dy}{dx}=\frac{2xy+3}{3+4xy^2}$
- $\frac{dy}{dx}=\frac{x+1}{x+xy^2}$
- $\frac{dy}{dx}=\frac{1}{x^2y+4y}$
- $\frac{dy}{dx}=1+y+x+xy$

Question No : 38 of 52 Marks: 1 (Budgeted Time 1 Min)

If the equation $M(x,y)dx+N(x,y)dy=0$ is not exact and $\mu=\frac{N_x-M_y}{M}$ is a function of y only, then the integrating factor is given by----------.

Answer (Please select your correct option)

- $I.F=e^{\int \mu dy}$
- $I.F=e^{\int 2\mu dy}$
- $I.F=e^{\int \frac{1}{2}\mu dy}$
- $I.F=e^{-\int \mu dy}$

$\frac{N_x-M_y}{M}$

Therefore, the IF is $u(y)=\exp\int\frac{dy}{y}=y$

Question No : 39 of 52 Marks: 1 (Budgeted Time 1 Min)

For the solution of the equation $\frac{-1}{y-1} = x + c$ *with* $y(0) = 3$, *the value of* c *is* - - -.

Answer (Please select your correct option)

- 0
- 1
- -1/2
- -1

Question No : 40 of 52 Marks: 1 (Budgeted Time 1 Min)

If $e^{2x}(c_1 \cos 3x + c_2 \sin 3x)$ is the solution of $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = 0$, then which of the following is the most accurate option for $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = e^{2x} \sin 3x$?

Answer (Please select your correct option)

- Its general form of the particular solution will be $Ae^{2x} + B\sin x + C\cos x$.
- Its general form of the particular solution will be $e^{2x}(A\sin x + B\cos x)$.
- Its general form of the particular solution will be $e^{2x}(Ax\sin x + Bx\cos x)$.
- Its general form of the particular solution will be $e^{2x}(Ax\sin 3x + Bx\cos 3x)$.

Question No : 41 of 52 Marks: 2 (Budgeted Time 4 Min)

Find the eigenvalues of the following system

$$X' = \begin{pmatrix} 3 & -9 \\ 4 & -3 \end{pmatrix} X$$

Answer (Please click here to Add Answer)

$$\begin{pmatrix} 3-a & -9 \\ 4 & -3-a \end{pmatrix}$$

hare use the lamanda..! not a

$$-9 - 3a + 3a + a^2 + 36 = 0$$

$$a^2 + 27$$

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)

yes, $A + B + C = A + (B + C) = (A + B) + C$ (Associative law of addition)

$A + B = B + A$ (Commutative law of addition)

$A(B + C) = AB + AC$ (Distributive lav

Question No : 43 of 52 Marks: 2 (Budgeted Time 4 Min)

Define regular and irregular singular points?

Answer (Please click here to Add Answer)

Definition: Regular and Irregular Singular Points

A Singular point $x = x_0$ of the given equation $a_2(x)y'' + a_1(x)y' + a_0(x)y = 0$ is said to be a ***regular singular point*** if both $(x - x_0)P(x)$ and $(x - x_0)^2 Q(x)$ are analytic at x_0. A singular point that is not regular is said to be an ***irregular singular point*** of the equation.

Question No : 44 of 52 Marks: 2 (Budgeted Time 4 Min)

Solve the differential equation:

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

Answer (Please click here to Add Answer)

$$2\int y\,dy = \int x^2\,dx$$

$$y^2 = \frac{x^3}{3} + c$$

Question No : 48 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)

Systematic Elimination: Operator Method

□ This method of solution of a system of linear homogeneous or linear nonhomogeneous differential equations is based on the process of systematic elimination of the dependent va

□ This elimination provides us a single differential equation in one of the dependent variables that has not been eliminated

.

--->>This equation would be a linear homogeneous or a linear non-homogeneous differential equation and can be solved by employing one of the methods discussed earlier to obtain dependent variables.

***Notice that* the analogue of multiplying an algebraic equation by a constant is operating on a differential equation with some combination of derivatives.**

Question No : 49 of 52 Marks: 5 (Budgeted Time 10 Min)

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

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-\frac{1}{64})y=0$$

Answer (Please click here to Add Answer)

Question No : 50 of 52 Marks: 5 (Budgeted Time 10 Min)

Write the following system in matrix form

$$\frac{dx}{dt}=x-y+z+t-1$$

$$\frac{dy}{dt}=2x+y-z-3t^2$$

Answer (Please click here to Add Answer)

Question No : 51 of 52 — Marks: 5 (Budgeted Time 10 Min)

What is indicial equation and exponent in the differential equation $xy'' + 3y' - y = 0$ with x=0 regular singular point?

Answer (Please click here to Add Answer)

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Question No : 52 of 52 — Marks: 5 (Budgeted Time 10 Min)

Determine the order and state the linearity of each of the following differential equations.

1) $\left(\frac{d^3y}{dx^3}\right)^4 + 2\frac{dy}{dx} = \sin x$

2) $\frac{dy}{\cdot} - 2xy = x^2 - x$

Answer (Please click here to Add Answer)

Answers to Above Exercises

1. order 3 , non linear.

2. order 1 , linear.

3. order 1 , non linear.

4. order 2 , linear.

1. $(\frac{d^3y}{dx^3})^4 + 2\frac{dy}{dx} = \sin x$

2. $\frac{dy}{dx} - 2xy = x^2 - x$

3. $\frac{dy}{dx} - \sin y = -x$

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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)**

The solution of $x^2 \frac{d^2y}{dx^2} = 0$ is

Answer (Please select your correct option)

- $y = c_1 + c_2 x$ — correct
- $y = c_1 x + c_2 x^2$
- $y = c_1 x + c_2 x^3$
- None of them

Question No : 2 of 52 **Marks: 1 (Budgeted Time 1 Min)**

The nature of roots of auxiliary equation deduced from Cauchy Euler equation

$4x^2 \frac{d^2y}{dx^2} + 8x \frac{dy}{dx} + y = 0$

Answer (Please select your correct option)

- Real and unequal
- Real and repeated — correct
- Complex
- None of them

Question No : 3 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)

- Positive radius of convergence
- Radius of convergence equals zero.
- None of them

correct

- Negative radius of convergence

Question No : 4 of 52 Marks: 1 (Budgeted Time 1 Min)

If E(t)=0, $R \neq 0$ (E(t) is thesource voltage & R is the resistance) then electric vibration of the circuit is said to be

Answer (Please select your correct option)

- Free damped oscillation

correct

- Free un-damped oscillation
- Both damped and un-damped oscillation
- None of them

Question No : 5 of 52 Marks: 1 (Budgeted Time 1 Min)

The quantity $Z = \sqrt{X^2 + R^2}$ is called

Answer (Please select your correct option)

- Reactance of circuit
- Impedance of circuit

correct

- Quasi of circuit
- None of them

Question No : 6 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- None of them
- Both the period
- Quasi-period

correct

- Phase period

Question No : 7 of 52 Marks: 1 (Budgeted Time 1 Min)

The Quasi-frequency of the solution **x(t)** of free damped motion is given by the number

Answer (Please select your correct option)

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

correct

- $\sqrt{\omega^2 - \lambda^2}$
- None of them

Question No : 8 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 $m_1 = -\lambda + \sqrt{\lambda^2 - \omega^2}$ & $m_1 = -\lambda - \sqrt{\lambda^2 - \omega^2}$ If $\lambda^2 - \omega^2 < 0$ then system is said to be

Answer (Please select your correct option)

- Over damped
- Critically damped
- Under damped

correct

- None of them

Question No : 9 of 52 Marks: 1 (Budgeted Time 1 Min)

The general solution of the equation $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-\frac{1}{25})=0$ is

Answer (Please select your correct option)

- $y=c_1J_{\frac{1}{3}}(x)+c_2J_{-\frac{1}{3}}(x)$
- $y=c_1J_{\frac{1}{4}}(x)+c_2J_{-\frac{1}{4}}(x)$
- $y=c_1J_{\frac{1}{3}}(x)+c_2J_{-\frac{1}{3}}(x)$ correct
- $y=c_1J_{\frac{1}{25}}(x)+c_2J_{-\frac{1}{25}}(x)$

Question No : 10 of 52 Marks: 1 (Budgeted Time 1 Min)

$J_{-\frac{2}{3}}(x)-J_{\frac{4}{3}}(x)=$

Answer (Please select your correct option)

- $2J'_{\frac{1}{3}}(x)$ correct
- $2J'_{\frac{2}{3}}(x)$
- $2J'_{\frac{4}{3}}(x)$
- None of them

Question No : 11 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 *matirx* $A\times B$ is

Answer (Please select your correct option)

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

Question No : 12 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)

- $1\times m$ — correct
- $2\times m$
- $m\times 1$
- None of them

Question No : 13 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- $\lambda = 5,3$
- $\lambda = 5,5$ — correct
- $\lambda = 3,4$
- None of them

Question No : 14 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- $\frac{dx}{dt}=3x-7y+4\sin 2t;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\cos t$
- $\frac{dx}{dt}=3x-7y+4\sin t;\ \frac{dy}{dt}=x+y+8\sin t$ — correct
- None of them

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)

- $\frac{dx}{dt}=3x-7y+4\sin 2t\ ;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4e^{-t};\ \frac{dy}{dt}=x+y+8e^{-t}$ correct
- $\frac{dx}{dt}=3x-7y+4e^{t};\ \frac{dy}{dt}=x+y+8e^{-t}$
- None of them

Question No : 16 of 52 Marks: 1 (Budgeted Time 1 Min)

The coefficient matrix of the following homogeneous system of differential equation $\frac{dx}{dt}=3x+2y\ ,\ \frac{dy}{dt}=x+2y$ is

Answer (Please select your correct option)

- $\begin{bmatrix}3&2\\2&2\end{bmatrix}$
- $\begin{bmatrix}3&1\\2&2\end{bmatrix}$
- $\begin{bmatrix}3&2\\1&2\end{bmatrix}$ correct
- None of them

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)

- Single root of A
- triple root of A correct
- double root of A
- None of them

Question No : 18 of 52 Marks: 1 (Budgeted Time 1 Min)

By applying the Operator method or systematic elimination on a system of linear homogeneous or linear non-homogeneous differential equations we always get a

Answer (Please select your correct option)

- Single linear differential equation — correct
- Double linear differential equation
- Partial linear differential equation
- None of them

Question No : 19 of 52 Marks: 1 (Budgeted Time 1 Min)

If L denote the linear differential operators with constant coefficients, then $L_1L_4 - L_2L_3$ represents the

Answer (Please select your correct option)

- $\begin{vmatrix} L_1 & L_2 \\ L_4 & L_3 \end{vmatrix}$
- $\begin{vmatrix} L_1 & L_3 \\ L_4 & L_2 \end{vmatrix}$
- $\begin{vmatrix} L_1 & L_2 \\ L_3 & L_4 \end{vmatrix}$ — correct
- None of them

Question No : 20 of 52 Marks: 1 (Budgeted Time 1 Min)

The matrix $\begin{bmatrix} 2 & 6 \\ 1 & 3 \end{bmatrix}$ is

Answer (Please select your correct option)

- Singular matrix — correct
- Non singular matrix
- Diagonal matrix
- Scalar Matrix

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)

- $x = \pm 1$
- $x = \pm 2$ correct
- $x = \pm 3$
- $x = \pm 4$

Question No : 22 of 52 Marks: 1 (Budgeted Time 1 Min)

Operator method is the method of the solution of a system of linear homogeneous or linear non-homogeneous differential equations which is based on the process of systematic elimination of the

Answer (Please select your correct option)

- Dependent variables correct
- Independent variable
- Choice variable
- None of them

Question No : 23 of 52 Marks: 1 (Budgeted Time 1 Min)

The non-zero solution of the system exists only when

Answer (Please select your correct option)

- $\det(A-\lambda I)=1$
- $\det(A-\lambda I)=0$ correct
- $\det(A-\lambda I)=-1$
- $\det(A-\lambda I)\neq 0$

Question No : 24 of 52 Marks: 1 (Budgeted Time 1 Min)

The solution of the linear first order differential equation $\frac{dy}{dx} - 2y = 0$ is

Answer (Please select your correct option)

- $y = e^{2x+c}$ correct
- $y = \sum_{n=0}^{\infty} \frac{x^n}{4n!}$
- Both 1) and 2)
- None of them

Question No : 25 of 52 Marks: 1 (Budgeted Time 1 Min)

Ordinary points of $(x^2 - 64)(x^2 - 36)y'' + xy' - y = 0$ are

Answer (Please select your correct option)

- 0,1
- 8,-8
- 6,-6
- None of others. correct

Question No : 26 of 52 Marks: 1 (Budgeted Time 1 Min)

Ir-regular singular point **of** the equation $(x^2 - 4)^2 y'' + (x - 2)y' + y = 0$ is

Answer (Please select your correct option)

- x = 2
- x = -2 correct
- x= -2, 2
- None of them

Question No : 27 of 52 Marks: 1 (Budgeted Time 1 Min)

The matrix $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ has .....

Answer (Please select your correct option)

- Real and unequal value
- Repeated & real eigen value — correct
- Complex eigen value
- None of them

Question No : 28 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)

- 1,2 — correct
- 0,1
- 0,2
- None of them

Question No : 29 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)

- Trivial equation
- Characteristics equation
- Non-trivial equation — correct
- None of them

Question No : 30 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)

- $\lambda = 1, 2$ — correct
- $\lambda = 2, 2$
- $\lambda = 1, 1$
- None of them

Question No : 31 of 52 Marks: 1 (Budgeted Time 1 Min)

Which of the following may not be considered as integration technique

Answer (Please select your correct option)

- By Parts
- By substitutions
- By Partial Fractions — correct
- None of these

Question No : 32 of 52 Marks: 1 (Budgeted Time 1 Min)

Which of the following equations satisfy the differential equation $\frac{dy}{dx} = x$

Answer (Please select your correct option)

- $2y = x^2 + c$ — correct
- $y = x^2 + c$
- $y = x^2$
- $y = x + c$

Question No : 33 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation $(3x^2y + 2)\,dx + (x^3 + y)\,dy = 0$ is -------.

Answer (Please select your correct option)

- Exact — correct
- Non-exact
- Separable
- Homogenous

Question No : 34 of 52 Marks: 1 (Budgeted Time 1 Min)

In order to change the Bernoulli Equation

$\frac{dy}{dx} + p(x)y = q(x)y^n$

into linear differential equation, we choose ----.

Answer (Please select your correct option)

- $v = y^{n-1}$
- $v = y^{1-n}$ — correct
- $v = y^n$
- $v = y'$

Question No : 35 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 $f(tx,ty) =$ ----.

Answer (Please select your correct option)

- $f(x,y)$ — correct
- $f(x)$
- $f(y)$
- C

Question No : 36 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation ---------- is separable.

Answer (Please select your correct option)

- $x(x+y)\frac{dy}{dx}=4$
- $\frac{dy}{dx}=\frac{x^2}{x+xy}$ correct
- $\frac{dy}{dx}=\frac{y}{1+xy^3}$
- $\frac{dy}{dx}=\frac{xy+3}{1+2xy}$

Question No : 37 of 52 Marks: 1 (Budgeted Time 1 Min)

The differential equation ---------- is not separable.

Answer (Please select your correct option)

- $\frac{dy}{dx}=\frac{2xy+3}{3+4xy^2}$ correct
- $\frac{dy}{dx}=\frac{x+1}{x+xy^2}$
- $\frac{dy}{dx}=\frac{1}{x^2y+4y}$
- $\frac{dy}{dx}=1+y+x+xy$

Question No : 38 of 52 Marks: 1 (Budgeted Time 1 Min)

If the equation $M(x,y)dx+N(x,y)dy=0$ is not exact and $\mu=\frac{N_x-M_y}{M}$ is a function of y only, then the integrating factor is given by----------.

Answer (Please select your correct option)

- $I.F=e^{\int \mu dy}$ correct
- $I.F=e^{\int 2\mu dy}$
- $I.F=e^{\int \frac{1}{2}\mu dy}$
- $I.F=e^{-\int \mu dy}$

Question No : 39 of 52 Marks: 1 (Budgeted Time 1 Min)

For the solution of the equation $\frac{-1}{y-1} = x + c$ *with* $y(0) = 3$, *the value of* c *is* - - -.

Answer (Please select your correct option)

- 0
- 1
- -1/2 — correct
- -1

Question No : 40 of 52 Marks: 1 (Budgeted Time 1 Min)

If $e^{2x}(c_1 \cos 3x + c_2 \sin 3x)$ is the solution of $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = 0$, then which of the following is the most accurate option for $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = e^{2x} \sin 3x$?

Answer (Please select your correct option)

- Its general form of the particular solution will be $Ae^{2x} + B\sin x + C\cos x$.
- Its general form of the particular solution will be $e^{2x}(A\sin x + B\cos x)$. — correct
- Its general form of the particular solution will be $e^{2x}(Ax\sin x + Bx\cos x)$.
- Its general form of the particular solution will be $e^{2x}(Ax\sin 3x + Bx\cos 3x)$.

Question No : 41 of 52 Marks: 2 (Budgeted Time 4 Min)

Find the eigenvalues of the following system

$$X' = \begin{pmatrix} 3 & -9 \\ 4 & -3 \end{pmatrix} X$$

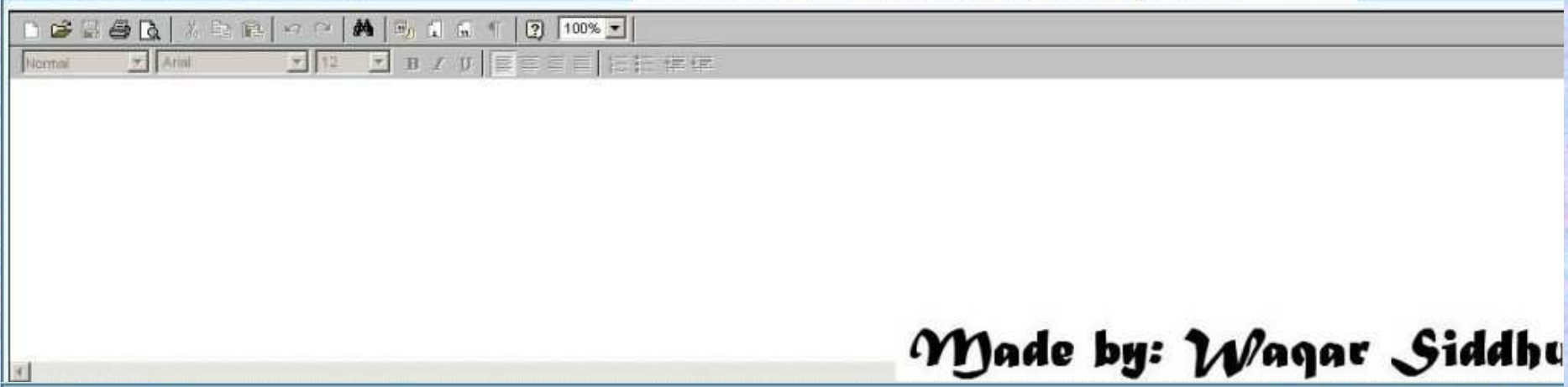
Answer (Please click here to Add Answer)

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

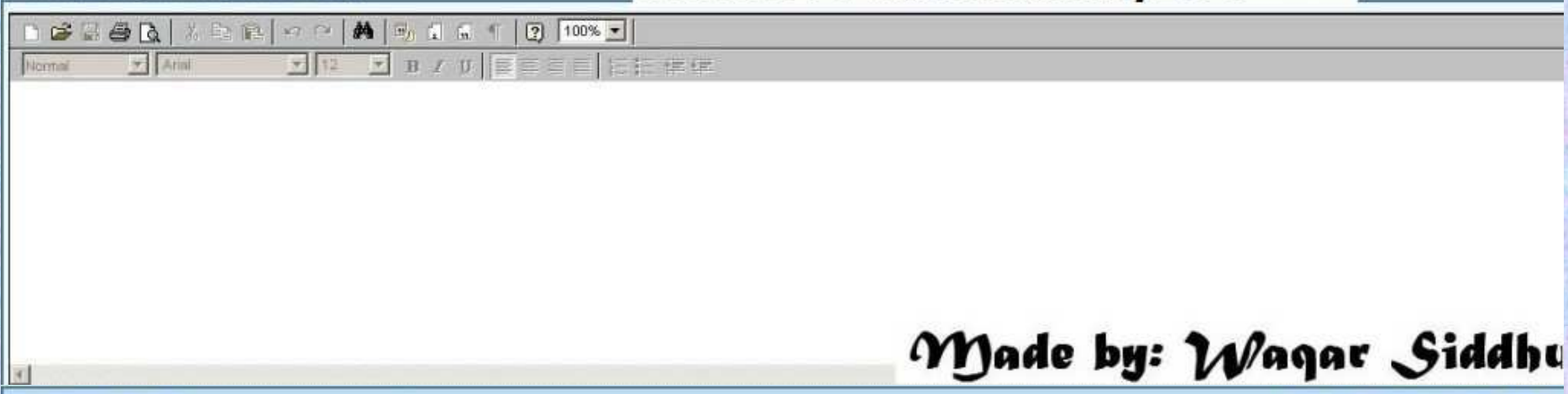
Answer (Please click here to Add Answer)



Question No : 43 of 52 Marks: 2 (Budgeted Time 4 Min)

Define regular and irregular singular points?

Answer (Please click here to Add Answer)



Question No : 44 of 52 Marks: 2 (Budgeted Time 4 Min)

Solve the differential equation:

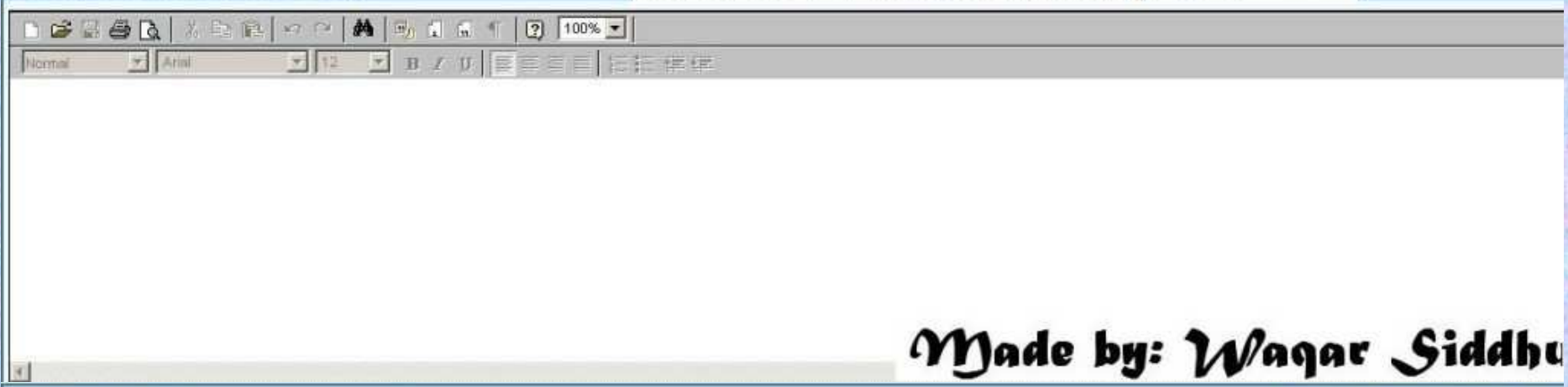
$$\frac{dy}{dx} = \frac{x^2}{2y}$$

Answer (Please click here to Add Answer)

Question No : 45 of 52 Marks: 3 (Budgeted Time 6 Min)

Find the complementry solution for the DE $y''-4y'+4y=2e^{2x}$?

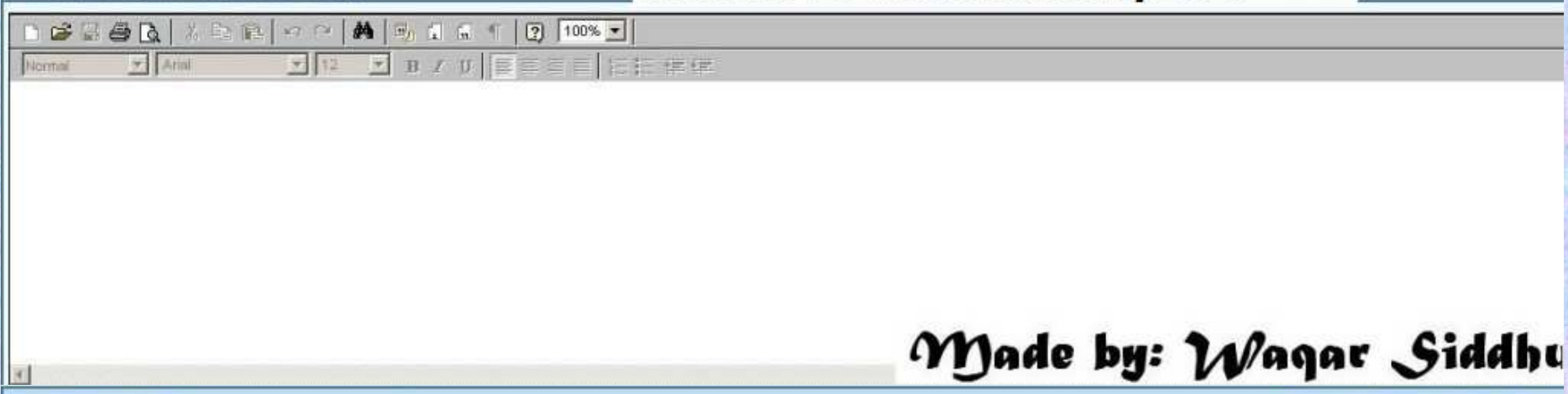
Answer (Please click here to Add Answer)



Question No : 46 of 52 Marks: 3 (Budgeted Time 6 Min)

When roots of indicial equation differ by a positive integer then explain the case when $r_1 = r_2$, where r_1 and r_2 are roots of the indicial equation.

Answer (Please click here to Add Answer)



Question No : 47 of 52 Marks: 3 (Budgeted Time 6 Min)

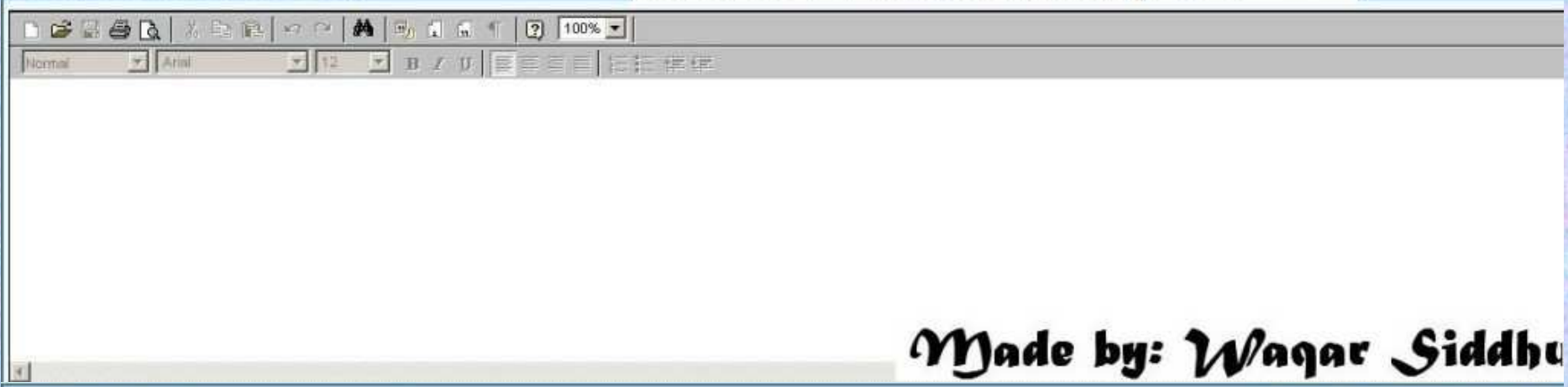
State Principal of superposition of set of solution vectors of a homogeneous system.

Answer (Please click here to Add Answer)

Question No : 48 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)

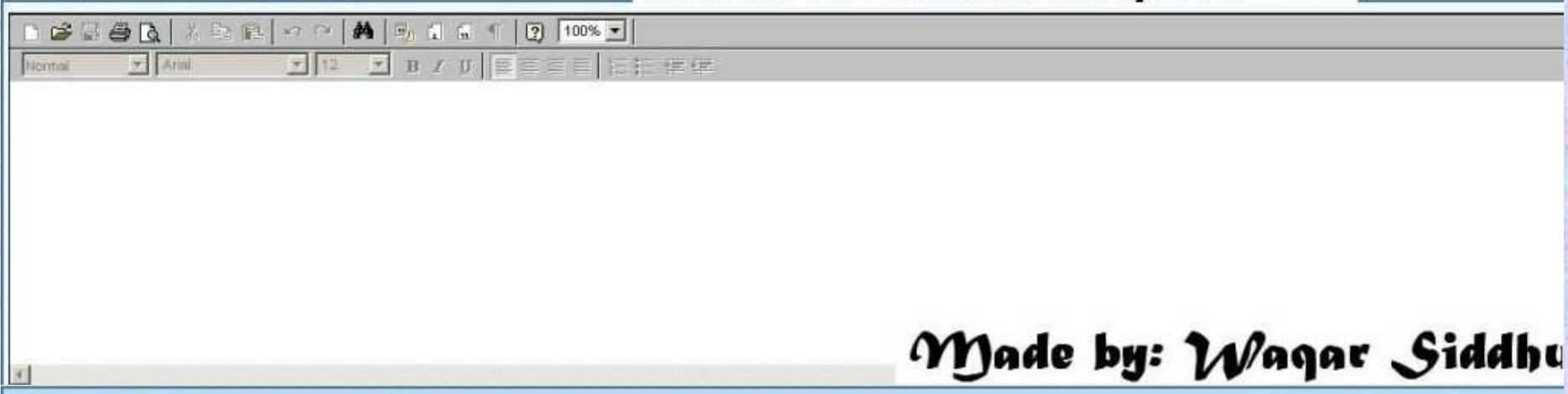


Question No : 49 of 52 Marks: 5 (Budgeted Time 10 Min)

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

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-\frac{1}{64})y=0$$

Answer (Please click here to Add Answer)



Question No : 50 of 52 Marks: 5 (Budgeted Time 10 Min)

Write the following system in matrix form

$$\frac{dx}{dt}=x-y+z+t-1$$

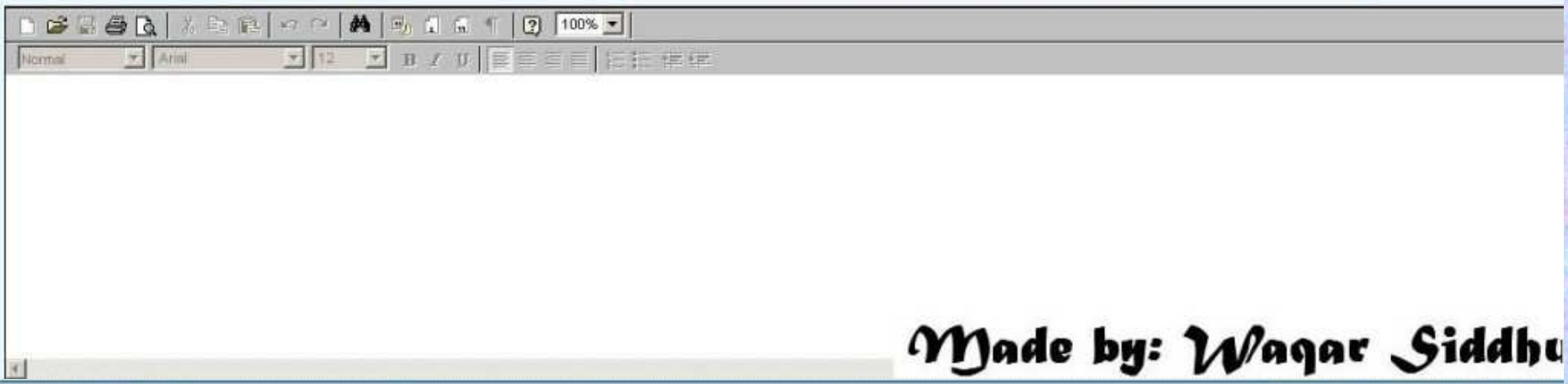
$$\frac{dy}{dt}=2x+y-z-3t^2$$

Answer (Please click here to Add Answer)

Question No : 51 of 52 — **Marks: 5 (Budgeted Time 10 Min)**

What is indicial equation and exponent in the differential equation $xy'' + 3y' - y = 0$ with x=0 regular singular point?

Answer (Please click here to Add Answer)



Question No : 52 of 52 — **Marks: 5 (Budgeted Time 10 Min)**

Determine the order and state the linearity of each of the following differential equations.

1) $\left(\frac{d^3y}{dx^3}\right)^4 + 2\frac{dy}{dx} = \sin x$

2) $\frac{dy}{\cdot} - 2xy = x^2 - x$

Answer (Please click here to Add Answer)

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بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِيْمِ

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)

The nature of the roots of the following D.E $x^2\frac{d^2y}{dx^2}-5x\frac{dy}{dx}+8y=0$ is

Answer (Please select your correct option)

- None of them
- real and distinct
- repeated roots
- complex or imaginary

Question No : 2 of 52 Marks: 1 (Budgeted Time 1 Min)

An infinite series of (x-a) in the form of $c_0+c_1(x-a)+c_2(x-a)^2+\ldots$ where the coefficients $c_0, c_1, c_2, \ldots$ and a are constants and x is a variable is called

Answer (Please select your correct option)

- Real series
- Analytic series
- Power series

correct

- 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 $\sum_{n=0}^{\infty} c_n (x-a)^n = c_0 + c_1(x-a) + c_2(x-a)^2 + \ldots$ the number **a** is called the

Answer (Please select your correct option)

- Radius of power series
- Centre of power series **correct**
- Base of power series
- None of them

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)

- Alternating series **correct**
- Divergent series
- Exponential series
- None of them

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)

- $y(x) = c_1 \cos\frac{x}{2} + c_2 Sin\frac{x}{2}$ **correct**
- $y(x) = c_1 \cos\frac{x}{2}$
- $y(x) = c_1 Sin\frac{x}{2}$
- None of them

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)

- Negative radius of convergence
- Positive radius of convergence
- Radius of convergence equals zero.
- None of them

correct

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 $m_1 = -\lambda + \sqrt{\lambda^2 - \omega^2}$ & $m_1 = -\lambda - \sqrt{\lambda^2 - \omega^2}$ If $\lambda^2 - \omega^2 = 0$ then system is said to be

Answer (Please select your correct option)

- Over damped
- Critically damped
- Under damped

correct

- None of them

Question No : 8 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- Quasi-period

correct

- Phase period
- Both the period
- None of them

Question No : 9 of 52 Marks: 1 (Budgeted Time 1 Min)

The Quasi-frequency of the solution **x(t)** of free damped motion is given by the number

Answer (Please select your correct option)

- $\frac{\sqrt{\omega^2 - \lambda^2}}{2\pi}$
- $\frac{2\pi}{\sqrt{\omega^2 - \lambda^2}}$ correct
- $\sqrt{\omega^2 - \lambda^2}$
- None of them

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)

- Over damped correct
- Critically damped
- Under damped
- None of them

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)

- Commutative law correct
- Associative law
- Identity law
- None of them

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 *matirx* $A\times B$ is

Answer (Please select your correct option)

- 2×4 — correct
- 2×3
- 3×3
- None of them

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)

- $1\times m$ — correct
- $2\times m$
- $m\times 1$
- None of them

Question No : 14 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- $\lambda = 5,3$
- $\lambda = 5,5$
- $\lambda = 3,4$
- None of them — correct

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)

- $\frac{dx}{dt}=3x-7y+4\sin 2t\ ;\ \frac{dy}{dt}=x+y+8\cos 2t$
- $\frac{dx}{dt}=3x-7y+4e^{-t};\ \frac{dy}{dt}=x+y+8e^{-t}$ correct
- $\frac{dx}{dt}=3x-7y+4e^{t};\ \frac{dy}{dt}=x+y+8e^{-t}$
- None of them

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)

- 1
- 2
- 3 correct
- 4

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)

- Single root of A
- triple root of A correct
- double root of A
- None of them

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)

- Linear
- Nonlinear

correct

- Linear with fixed constants
- Undeterminable to be linear or nonlinear

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)

- A is singular matrix.
- A is non singular matrix.
- A is scalar matrix.

correct

- A is diagonal matrix.

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)

- $x = \pm 1$
- $x = \pm i$

correct

- $x = \pm 2$
- $x = \pm 2i$

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)

- $x = \pm 1$
- $x = \pm 2$ correct
- $x = \pm 3$
- $x = \pm 4$

Question No : 22 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

- Homogeneous equation
- Polar equation
- Equi-dimensioanl equation
- None of them

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)

- $y = x^3$
- None of them
- $x = e^t$ correct
- $y = e^t$

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)

- Equation
- derterminant
- Matrix

correct

- None of them

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)

- infinite
- one
- two

correct

- three

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)

- Linearly Independent

correct

- Linearly dependent
- None of them
- Parallel

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)

- 1,2 — correct
- 0,1
- 0,2
- None of them

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)

- Trivial equation
- Characteristics equation
- Non-trivial equation — correct
- None of them

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)

- 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

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)

- x, t
- y, t
- x, y
- t

correct

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)

- $\lambda = 2, 2$
- $\lambda = 1, 1$
- None of them
- $\lambda = 1, 2$

correct

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)

- no constant
- one constant

correct

- two constants
- three constants

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)

- Singular solution
- Particular solution — correct
- Explicit Solution
- None of these

Question No : 34 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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

Question No : 35 of 52 Marks: 1 (Budgeted Time 1 Min)

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

Answer (Please select your correct option)

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

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 $f(tx,ty) =$ ----.

Answer (Please select your correct option)

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

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)

- $y = 1$ correct
- $y = 0$
- $x = 1$
- $x = 0$

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)

- Non-intersecting curves
- Parallel curves
- Orthogonal curves correct
- Intersecting curves

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)

- $K = \frac{20}{\ln 2}$
- $K = -\frac{20}{\ln 2}$
- $K = -\frac{\ln 2}{20}$ correct
- $K = \frac{\ln 2}{20}$

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_____

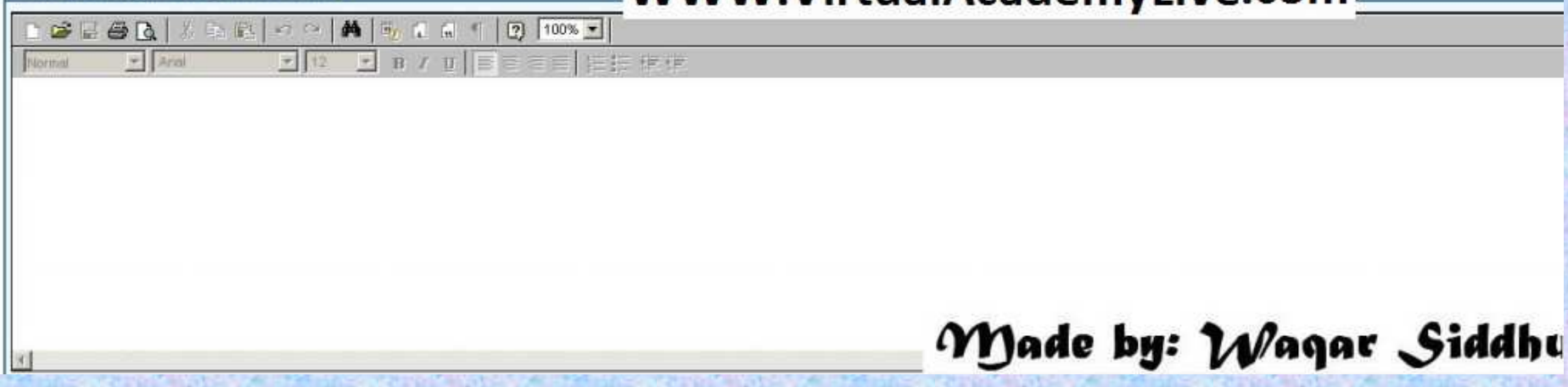
Answer (Please select your correct option)

- $(m+4)(m+2)$
- $(D+4)(D+2)$ correct
- D^2
- $((D+4)(D+2))y$

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)



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)

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)

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)

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)

Question No : 46 of 52 Marks: 3 (Budgeted Time 6 Min)

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

Answer (Please click here to Add Answer)

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)

Question No : 48 of 52 Marks: 3 (Budgeted Time 6 Min)

Write the following system in matirx form

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

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

$\frac{dz}{dt}$

Answer (Please click here to Add Answer)

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)

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)

Question No : 50 of 52 Marks: 5 (Budgeted Time 10 Min)

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

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

Answer (Please click here to Add Answer)

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)

Question No : 52 of 52 Marks: 5 (Budgeted Time 10 Min)

Given that $y=c_1e^x+c_2e^{-x}$ is a two parameter family of solutions of the differential equation $\frac{d^2y}{dx^2}-y=0$ on $(-\infty,\infty)$ find a member of the family satisfying the boundary conditions

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

Answer (Please click here to Add Answer)