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

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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

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

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

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

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Answer (Please select your correct option)

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

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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

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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

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Question No : 4 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

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

- Reactance of circuit
- Impedance of circuit

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- Quasi of circuit
- None of them

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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

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Answer (Please select your correct option)

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

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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

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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

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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

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Answer (Please select your correct option)

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

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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

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

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

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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

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Answer (Please select your correct option)

- 2×4
- 2×3
- 3×3
- None of them

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

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

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Answer (Please select your correct option)

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

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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

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

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Answer (Please select your correct option)

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

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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

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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

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

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

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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

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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*

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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

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

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

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Answer (Please select your correct option)

- Single root of A
- triple root of A
- double root of A

i think.. becz mul
of -1

- None of them

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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

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Answer (Please select your correct option)

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

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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

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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

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

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

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

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

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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-homogeneous 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.

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Answer (Please select your correct option)

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

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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

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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

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

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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

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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

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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

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Answer (Please select your correct option)

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

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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

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

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

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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

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Answer (Please select your correct option)

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

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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

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Answer (Please select your correct option)

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

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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 $\begin{bmatrix} 1 & 0 \\ 2 & 2 \end{bmatrix}$

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Answer (Please select your correct option)

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

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

Which of the following may not be considered as integration technique

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

- Exact
- Non-exact
- Separable
- Homogenous

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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 ----.

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Answer (Please select your correct option)

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

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

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

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

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

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

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Answer (Please select your correct option)

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

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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----------.

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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 $u(y)=\exp\int\frac{dy}{y}=y$

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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* - - -.

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Answer (Please select your correct option)

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

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

If $e^{2x}\left(c_1 \cos 3x + c_2 \sin 3x\right)$ 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 $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = e^{2x}\sin 3x$?

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

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

Find the eigenvalues of the following system

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

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Answer (Please click here to Add Answer)

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

hare use the lamanda..! not a

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

$a^2 + 27$

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

Is generally in matrices following laws hold or not?

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

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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

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

Define regular and irregular singular points?

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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.

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

Solve the differential equation:

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

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Answer (Please click here to Add Answer)

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

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

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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".

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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.**

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

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

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

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Answer (Please click here to Add Answer)

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

Write the following system in matrix form

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

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

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Answer (Please click here to Add Answer)

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

Answer (Please click here to Add Answer)

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

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

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

Answers to Above Exercises

1. order 3 , non linear.

2. order 1 , linear.

3. order 1 , non linear.

4. order 2 , linear.

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