UNIT-1

Q. The eigen values of the matrix $\begin{bmatrix} 3 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 1 & 4 \end{bmatrix}$ are

(a) 2,-2,1 (b) 3,-2,4 (c) 2,3,1 (d) none of these

Q. The characteristic equation of a matrix A of order 3 is $\lambda^3 + \lambda^2 + 2\lambda + 1 = 0$. If I denotes identity matrix, then the inverse of the matrix A will be:

(a) $\mathrm{A}^2 + \mathrm{A} + 2\mathrm{I}$ (b) $\mathrm{A}^2 + \mathrm{A} + \mathrm{I}$ (c) $-(\mathrm{A}^2 + \mathrm{A} + \mathrm{I})$ (d) $-(\mathrm{A}^2 + \mathrm{A} + 2\mathrm{I})$

Q. Consider the matrix A = $\begin{bmatrix} 2 & 3 \\ x & y \end{bmatrix}$. If the eigen values of A are 4 and 8, then

(a) x = 4, y = 10 (b) x = 5, y = 8 (c) x = -3, y = 9 (d) x = -4, y = 10

Q. A homogeneous system of 2 linear equations in 3-variables admits

(a) no solution

(b) a unique solution

(c) infinitely many solutions

(d) finite, but more than two solutions

Q. If the characteristic roots of $\begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ are λ_1 and λ_2, then characteristic roots of the matrix $\begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix}$ are:

(a) $\lambda_1 + \lambda_2, \lambda_1 - \lambda_2$ (b) $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}$ (c) $2\lambda_1, 2\lambda_2$ (d) $3\lambda_1, 3\lambda_2$

Q. All the four entries of the matrix P = $\begin{bmatrix} P_{11} & P_{12} \\ P_{21} & P_{22} \end{bmatrix}$ of order 2 are non-zero, and one of its eigen values is zero. Which one of the following statements is true?

(a) $P_{11}P_{22} - P_{12}P_{21} = 1$

(b) $P_{11}P_{22} - P_{12}P_{21} = -1$

(c) $P_{11}P_{22} - P_{12}P_{21} = 0$

(d) $P_{11}P_{22} + P_{12}P_{21} = 0$

Q. For what value of x will the matrix A = $\begin{bmatrix} 8 & x & 0 \\ 4 & 0 & 2 \\ 12 & 6 & 0 \end{bmatrix}$ become singular?

(a) 4 (b) 6 (c) 8 (d) 12

Q. The inverse of a matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ is

(a) $\begin{bmatrix} -1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -3 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{3} \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{2} \end{bmatrix}$ (d) None of these

Q. The sum of eigen values of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ is

(a) 5 (b) 4 (c) 7 (d) 9

Q. The rank of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ is

(a) 0 (b) 1 (c) 2 (d) 3

Unit-2

Q. The wronskian of the functions $x,\ x^2,\ x^3$ is

(a) $2x$ (b) $2x^2$

(c) $2x^3$ (d) $2x^4$

Q. Which of the following are true for the differential equation $x^2y'' - xy' = 0, x > 0$?

(a) $1, x^2$ are solutions (b) $c_1 + c_2x^2$ is also solution

(c) $1, x^2$ are L.I. (d) All of these

Q. Which of the following is linear differential equation with constant coefficient?

(a) $y'' - a^2y = 0$ (b) $y' = \frac{y}{x}$

(c) $x^3y''' + 9x^2y'' + 18xy' + 6y = 0$ (d) $y'' - (1 + x^2)y = 0$

Q. The solution of the differential equation $y''' - y'' - 4y' + 4y = 0$ is

(a) $y = Ae^x + Be^{-2x} + Ce^{3x}$ (b) $y = Ae^x + Be^{-2x} + Ce^{2x}$

(c) $y = Ae^x + Be^{2x} + Cxe^{2x}$ (d) $y = Ae^{-x} + Be^{-2x} + Ce^{3x}$

UNIT 3

Q. Let $y(x) = A(x)e^{-x} + B(x)e^{-2x}$ be the general solution of the differential equation $y'' + 3y' + 2y = 2e^{x}$,

(1) Value of wronskian is

(a) e^{-2x} (b) $-e^{-2x}$

(c) e^{-3x} (d) $-e^{-3x}$

(2) Value of $A(x)$ is

(a) $e^{x} + c_1$ (b) $e^{2x} + c_1$

(c) $e^{3x} + c_1$ (d) $e^{4x} + c_1$

Q. Assumed particular integral of $y'' + 9y = cos3x$ is

(a) $c_1 cos3x + c_2 sin3x$ (b) $c_1 xcos3x + c_2 sin3x$

(c) $c_1 cos3x + c_2 xsin3x$ (d) $c_1 xcos3x + c_2 xsin3x$

Q. Using transformation, the differential equation $2x^2y'' + 3xy' - 3y = x^3$ becomes

(a) $\frac{d^2y}{dt^2} + \frac{dy}{dt} - y = e^{3t}$ (b) $\frac{d^2y}{dt^2} + \frac{dy}{dt} + y = e^{3t}$

(c) $2\frac{d^2y}{dt^2} + \frac{dy}{dt} - 3y = e^{3t}$ (d) None of these

Q. To transform $x^2y'' + xy' = 1$ into a linear differential equations with constant coefficient, put x=

(a) $\sin t$ (b) $\log t$ (c) e^{t} (d) none of these

Q1b. To transform $x^2y'' + 2xy' = 3$ into a linear differential equations with constant coefficient, put x=

(a) $\sin t$ (b) $\log t$ (c) e^{t} (d) none of these

Q. The particular integral of $x^2y'' + xy' = x^2, \quad x > 0$ is

(a) $\frac{x}{4}$ (b) $\frac{x^2}{4}$ (c) $\frac{e^2}{4}$ (d) $\frac{e^{2x}}{4}$

Q The particular integral of $x^2y'' + xy' = \sin(\log x), \quad x > 0$ is

(a) $\sin(\log x)$ (b) $\cos(\log x)$ (c) $-\cos(\log x)$ (d) $-\sin(\log x)$

Q. If $y(x) = A(x)y_1 + B(x)y_2$ be the assumed general solution of linear diff equation $y'' + ay' + by = X(x)$ and w(x) be the Wronskian of $y_1(x)$ *and* $y_2(x)$ then by method of variation of parameter the value of A(x) is

(a) $\int \frac{y_1 X}{W} dx$ (b) $\int \frac{y_2 X}{W} dx$ (c) $-\int \frac{y_2 X}{W} dx$ (d) none of these

Q If $y(x) = A(x)y_1 + B(x)y_2$ be the assumed general solution of linear diff equation $y'' + ay' + by = X(x)$ and w(x) be the Wronskian of $y_1(x)$ *and* $y_2(x)$ then by method of variation of parameter the value of B(x) is

(a) $\int \frac{y_1 X}{W} dx$ (b) $\int \frac{y_2 X}{W} dx$ (c) $-\int \frac{y_2 X}{W} dx$ (d) none of these

Q The complementary function y_c of the differential equation $(1+x)^2 y'' + (1+x)y' + y = \log(1+x)$ is

(a) $C_1 x + C_2[\log(1+x)]$ (b) $C_1 \cos[\log(1+x)] + C_2 \sin[\log(1+x)]$ (c) $(C_1(1+x) + C_2[\log(1+x)]$ (d) none of these

Q The complementary function y_c of the differential equation $(1+x)^2 y'' - 4(1+x)y' + 6y = x$ is

(a) $(C_1(x+1)^2 + C_2(x+1)^{-3}$ (b) $(C_1(x+1)^2 + C_2(x+1)^3$

(c) $(C_1(x+1)^{-2} + C_2(x+1)^3$ (d) none of these

Q Solving by variation of parameter $y'' + 4y = \tan 2x$, the value of Wronskian W is

(a) 1 (b) 2 (c) 3 (d) 4

Q Solving by variation of parameter $y'' + y = \sec x$, the value of Wronskian W is

(a) 1 (b) 2 (c) 3 (d) 4

Q Using transformation, the differential equation $2x^2 y'' + 3xy' - 3y = x^3, \quad x > 0$ becomes

(a) $\frac{d^2y}{dt^2} + \frac{dy}{dt} - y = e^{3t}$ (b) $\frac{d^2y}{dt^2} + \frac{dy}{dt} + y = e^{3t}$

(c) $2\frac{d^2y}{dt^2}+\frac{dy}{dt}-3y=e^{3t}$ (d) None of these

Q. Using transformation, the differential equation $x^2y''+5xy'+3y=\ln x, \quad x>0$ becomes

(a) $\frac{d^2y}{dt^2}+3\frac{dy}{dt}+4y=t$ (b) $\frac{d^2y}{dt^2}+3\frac{dy}{dt}+4y=e^t$

(c) $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+3y=e^t$ (d) $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+3y=t$