JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE	**JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE** Shri Ram ki Nangal, via Sitapura RIICO Jaipur- 302 022.	**Academic year 20e19-20**

Weak Students ASSIGNMENT
Year: B. Tech. I Year
Semester: II
Subject: Engineering Mathematics - II
Session: 2020-21

CO1. To understand the concept of rank of matrix, inverse, Eigen values & vectors along with solution of linear simultaneous equation determine inverse of a matrix using Cayley Hamilton Theorem.

1 Define the rank of a matrix.

2 Determine the rank of the following matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ (RTU 2008)

3 Find the rank of the following matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ b+c & c+a & a+b \\ bc & ca & ab \end{bmatrix}$

4 Find the rank of the following matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{bmatrix}$ [Gate CS 2018]

5 Using the Gauss method find the inverse of the matrix

(i) $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ (ii) $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$ (iii) $\begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$

6 Reduce the following matrix into its normal form and hence find its Rank

(i) $\begin{bmatrix} 2 & 1 & -1 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ (iii) $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$

7. Investigate the values of λ and μ so that the equations

$2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + \lambda z = \mu$ have [Gate CE 2019]

(i) No solution (ii) unique solution (iii) many solution

8. For what values of k the equation $x + y + z = 6, x + 2y + 3z = k,\ 4x + y + 10z = k^2$ have a solution and solve them completely in each case.

9. Investigate the values of λ and μ so that the equations

$x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ have

No solution (ii) unique solution (iii) many solution RTU (2002, 2006)

10. T est for consistency and solve

(i) $2x - 3y + 7z = 5, 3x + y - 3z = 13, 2x + 19y - 47z = 32$

(ii) $5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5$

(iii) $x + 2y + 3z = 14, 3x + y + 2z = 11, 2x + 3y + z = 11$

(iv) $2x + 3y + 4z = 11, x + 5y + 7z = 15, 3x + 11y + 13z = 25$ (RTU 2007)

12. Find the value of a and b for which the equation

$x + ay + z = 3$, $x + 2y + 2z = b$, $x + 5y + 3z = 9$ are consistent.

13. Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

14. Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

15. Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

16. Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. (RTU 2014)

17. Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

18. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and find its inverse. Also express $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as linear polynomial in A.

19. Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence compute A^{-1}.also find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$.

20. Verify Cayley-Hamilton theorem for the matrix A and find its inverse

(i) $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$ (RTU 2015)

21. Using the Cayley-Hamilton theorem, find the inverse of

(i) $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$ (iii) $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ 2 & -4 & -4 \end{bmatrix}$ (iv)) $\begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & 1 \end{bmatrix}$

22. Reduce the matrix $A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to the diagonal form. (RTU 2000)

23. State Cayley-Hamilton theorem.

24. Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence compute A^{-1}.also find the matrix represented by $A^5 - 5A^4 + 3A^3 + 6A^2 - 6A + 2I$.

25. State and explain the application of Cayley-Hamilton theorem.

26. Find the sum and product of Eigen values of a matrix

$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

27. Find the sum and product of Eigen values of a matrix

A= $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$

28. Find the sum and product of Eigen values of a matrix

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

29. Test for consistency and solve:

$$x + 2y + z = 3, 2x + 3y + 2z = 5, 3x - 5y + 5z = 2, 3x + 9y - z = 4$$

Q30. Test for consistency and solve:

$$2x - 3y + 7z = 5, 3x + y - 3z = 13, 2x + 19y - 47z = 32$$

Q31. Test for consistency and solve:

$$x + 2y + 3z = 14, 3x + y + 2z = 11, 2x + 3y + z = 11$$

Q32. A 4 X 4 matrix is given below. Find its Eigen Values $\begin{bmatrix} 0 & 1 & 3 & 0 \\ -2 & 3 & 0 & 4 \\ 0 & 0 & 6 & 1 \\ 0 & 0 & 1 & 6 \end{bmatrix}$ [Gate CE 2020]

Q34. The inverse of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ is…………

[Gate CE 2019]

Q35. If X is an invertible square matrix then comment on its determinant. [Gate CSE 2019]

Q36. The rank of the matrix is M = $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ [Gate EE 2019]

Q37. Find the rank of the following matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{bmatrix}$

Q38. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and find its inverse. Also express $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as linear polynomial in A.

Q39. Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$

Q40. Reduce the matrix $A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to the diagonal form. (RTU 2011)

Q41. State and prove Cayley – Hamilton theorem.

Q42. Reduce the following matrix into its normal form and hence find its Rank $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$

Q43. Using the Cayley-Hamilton theorem, find the inverse of $\begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$

Q44 Using the Cayley-Hamilton theorem, find the inverse of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ 2 & -4 & -4 \end{bmatrix}$

Q45.Using the Cayley-Hamilton theorem, find the inverse of (RTU 2014) $\begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & 1 \end{bmatrix}$

Q46. Determine rank of the following matrices.

(i) $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$

Q47. Determine rank of the following matrices. (RTU 2016)

$$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$

Q48. Find the Eigen values and Eigen vectors of the Following matrices.

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

Q49. Find the Eigen values and Eigen vectors of the Following matrices. (RTU 2011)

(i) $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$

Q50. Diagonalize the matrix A= $\begin{bmatrix} -1 & 1 & 2 \\ 0 & -2 & 1 \\ 0 & 0 & -3 \end{bmatrix}$ (RTU 2012)

Co2: To solve Ordinary D.E of first order, first degree and first order higher degree using various methods

Q1. Solve: $(x^4y^4 + x^2x^2 + xy)ydx + (x^4y^4 - x^2x^2 + xy)xdy = 0$ (RTU 2016)

Q2. Solve: $(D^2 + a^2)y = \sec ax$

Q3. Solve: $(1+e^{\frac{x}{y}})dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right) dy = 0$

Q4. Solve: $(D^2 + 3D + 2)\, y = e^{2x} \sin x$

Q5. Solve: $[(3x+2)^2 D^2 + 3(3x+2) D-36]y = 3x^2 + 4x + 1$

Q6. Solve: $(2x^2+3x)\left(\frac{d^2y}{dx^2}\right) + (6x + 3)\left(\frac{dy}{dx}\right) + 2y = (x + 1)e^x$ (RTU2018)

Q7. Solve: $(D^2 + 3D + 2)\, y = \sin x$

Q8. Solve $(1 + xy)ydx + (1 - xy)xdy = 0$

Q9. Solve $(x^3y^2 + x)dy + (x^2y^3 - y)dx = 0$

Q10. Solve $\left(xy^2 - e^{1/x^3}\right) dx - x^2ydy = 0$

Q11. Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$ (RTU 2014)

Q12. Solve $(xy + y)dx + 2(x^2y^2 + x + y^3)dy = 0$

Q13. Solve the differential equation:

a. $(xy \sin xy + \cos xy)ydx + (xy \sin xy - \cos xy)xdx = 0$

Q14. Solve $(xy^5 + y)\, dx - dy = 0$

Q15. Solve $x^2\left(\frac{dy}{dx}\right)^2 - 2xy\left(\frac{dy}{dx}\right) + 2y^2 - x^2 = 0$

Q16. Find the general solution of the differential equation $y= (2y^4+2x)\, y'$.

Q17. Solve the DE $\frac{dy}{dx} = \frac{2y-x-4}{y-3x+3}$

Q18. Solve the following differential equation :$(2y^2+3x)dx+2xydy=0$. [GATE (EC) 2003]

Q19. Solve $(y + xy^2)\, dx - xdy = 0$.

Q20. Solve the equation $y''+25y=0$.

Q21. Solve $t\, y'' + 4\, y' = t^2$

Q22. If a particular integral of the differential equation $(D^2+2D-1)\, y=e^{ax}$ is $(-4/7)\, e^{ax}$ then the value of a is?

Q23. Solve the differential equation $\frac{d^2y}{dx^2} + a^2y = cosec\, x$.

Q24. Solve equation $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$.

Q25. Solve $x^2\left(\frac{dy}{dx}\right)^2 + 2x\frac{dy}{dx} - y = 0$.

Q26. Solve $x^2\left(\frac{dy}{dx}\right)^2 - 2xy\left(\frac{dy}{dx}\right) + 2y^2 - x^2 = 0$

Q27. Solve $\frac{dy}{dx} + \frac{1}{ylogy}x = \frac{1}{y}$

Q28. Solve $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)\, dy = 0$

Q29. The Solution of Differential Equation [GATE (EC) 2003]

a. $\frac{dy}{dx} + y^2 = 0$ is………

Q30. The integrating factor for the differential equation [GATE (CH) 2014]

(a) $\frac{dy}{dx} - \frac{y}{1+x} = (1+x)$ is ……..

Q31. Solve $(x + xy)dx + (y - xy)xdy = 0$

Q32. Solve $(x^3y^2 + x)dy + (x^2y^3 - y)dx = 0$

Q33. Solve $(x + y^3)dx + 2(x^2y^2 + x + y^4)dy = 0$

Q34. Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$

Q35. The Solution of the initial value problem [GATE (ME) 2014]

a. $\frac{dy}{dx} = -2xy,\ y(0) = 2$ is ……..

Q36. Solve the equation $(2D^2 + D - 1)y = 16\cos 2x$

Q37. Solve the differential equation $(D^4 + 16D^2)y = x^2 + 5$.

Q38. Solve $\frac{d^2y}{dx^2} + y = x\sin x$, using method of variation of parameter.

Q39. Solve $\frac{d^2y}{dx^2} + (1 - \cot x)\frac{dy}{dx} - \cot x\, y = sin^2 x.$

Q40. Solve the differential equation $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + 8y = 65\cos(logx)$

Q41. Solve $(3x+2)^2\frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$

Q42. Solve $\frac{dx}{dt} + 2y = e^t$, $\frac{dy}{dt} - 2x = e^{-t}$

Q43. Solve: $\frac{dy}{dx} = \frac{1}{xy(x^2y^2+1)}$

Q44. Solve $(D^2 + a^2)y = \tan ax$ [GATE (CE) 2004]

Q45. Solve $(D^2 - 3D + 2)y = e^x$

Q46. Solve $\frac{d^3y}{dx^3} + (\tan x - 3\cos x)\frac{dy}{dx} + 2y cos^2 x = \cos^4 x$

Q47. Solve $(x^2 - ay)dx + (ax - y^2)dx = 0$ [GATE (EC) 2003]

Q48. Solve : $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{2x} + x^2 + x$

Q49. Solve : $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 2x^2$

Q50. Solve equation $\frac{d^2y}{dx^2} - 4y = \sinh(2x-1) + 3^x$.

CO3 To find the complete solution of D.E of higher order with constant coefficient & variable coefficients

Q1. $x\frac{d^2y}{dx^2}$ +(x+n) $\frac{dy}{dx}$+ (n+1)y=0 ,where n is not an integer.

Q2. Solve y"+y=0 by power series method

Q3. Find the series solution of (x-x2) y" + (1- 5x)y' – 4y = 0 about x = 0. (RTU2016)

Q4. Find the series solution of $(x-x^2)$ y" + (1- 5x)y' – 4y = 0 about x = 0.

$X(1-x^2)\frac{d^2y}{dx^2} + (1-3x^2)\frac{dy}{dx} - xy = 0$,

Q5. Find the series solution of $(1-x^2)\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} + y = 0$

Q6. Find the series solution of $x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + x^2y = 0$. (RTU2015)

Q7. Find the series solution of $2x^2\frac{d^2y}{dx^2} + (2x^2 - x)\frac{dy}{dx} + y = 0$. .

Q8. Find the series solution of $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2-1)y = 0$.

Q9. Solve the following Legendre's Differential Equation

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

Q10. Find the series solution of $(1-x)\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} - y = 0$,

Q11. Solve the differential equation: $\frac{d^2y}{dx^2} - 4y = \sin h(2x+1) + 4^x$

Q12. Solve the differential eq. $(D^2+3D+2)y = e^{e^x}$

Q13. Ordinary differential equation is given below. Find its general solution. [Gate (CE) 2020]

$6\frac{d^2y}{dx^2} + \frac{dy}{dx} - y = 0$

Q14. Complementary function(C.F) of $(D^4 + 2D^3 - 3D^2)y = x^2$ is

Q15. The particular integral(P.I) of $(D^2 + 4)y = \cos 2x$ is :

Q16. Check whether the given equation is exact or not.

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

Q17. Solve the equation $\frac{d^3y}{dx^3} + 4y = 4tan2x$

Q18. Solve in series $2x^2y" + xy' - (x+1)y = 0(5)$

Q19. Solve $(D^2 - 2D + 4)y = e^x \cos x$.

Q20. Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = \sin(logx^2)$

Q21. Solve $cos\ x\ \frac{d^2y}{dx^2} + \sin x\frac{dy}{dx} - 2ycos^3x = 2cos^5x$

Q22. Using the method of variation of parameter, solve $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$ (RTU 2014)

Q23. Solve $x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 2y = 2x^2 + 10$

Q24. Solve $(D^2 - 2D + 4)y = e^x \sin x$.

Q25. Solve: $(y^2 - ay)dy + (ax - x^2)dx =$

Q26. Solve $(x^2 - ay)dy + (ax - y^2)dx = 0$

Q27. Solve : $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{2x} + x^2 + x$

Q28. Solve : $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 2x^2$

Q29. Solve : $(D^2 - 4D + 4)y = 8\,x^2e^{2x}sin2x$

Q30. Solve : $(D^2 - 5D + 4)y = x^2 e^{2x} sinx$

Q31. The Differential Equation [GATE (CE) 2014]

$x^2 \frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = e^{2x}$ is a ……….

Q32. The general solution of differential equation

$x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$ is a ……….

Q33. Q33.Consider the differential equation

$x^2 \frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - y = 0.$ Which of the solution of this equation for x>0? [GATE (EE) 2014]

Q34. .If y=f(x) is solution of $\frac{d^2y}{dx^2} = 0$ with the boundary condition y=5 at x=0,

and $\frac{dy}{dx} = 2 \; at \; x = 10, f(15) = \cdots$ … … … … ..

[GATE (ME) 2014]

Q35. Q35. The Differential equation

$\frac{d^2y}{dx^2} + (x^2 + 4x)\frac{dy}{dx} + y = x^8 - 8$ is……………. [GATE (ME) 1999]

Q36. Solve $\frac{d^2y}{dx^2} - \cot x \frac{dy}{dx} - sin^2x . y = \cos x - cos^3 x$

Q37. Solve $\boldsymbol{x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = x^2 logx}$.

Q38. Complementary function(C.F) of $\boldsymbol{(D^5 + 2D^3 - 3D^2)y = x^2 \; is}$ … [GATE (CE) 1999]

Q39. The particular integral(P.I) of $\boldsymbol{(D^2 + 4)y = \cos 4x \; is}$:

Q40. Solve the differential equation $(D^2$-D-2)y =$\boldsymbol{e^{e^x}}$+3 using method of variation of parameter .

Q41. Solve $\boldsymbol{x^2 \frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 3y = (1 + x)^2}$Using Method of Variation of Parameter.

Q42. Solve d^2y/d^2x –y=2/1+e^x (variation of parameter)

Q43. Solve $\boldsymbol{\frac{d^2y}{dx^2}}$ - 4x$\boldsymbol{\frac{dy}{dx}}$ + $(4x^2$-1) y = -3$\boldsymbol{e^{e^x}}$sin 2x

Q44. Solve $\boldsymbol{x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = (1 + x)^2}$

Q45. Solve $\boldsymbol{x^3 \frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} + 2y = 10(x + \frac{1}{x})}$

Q46. Solve $\boldsymbol{(2 + 3x)^2 \frac{d^2y}{dx^2} + 3(2 + 3x)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1}$ **(RTU 2014)**

Q47. Solve $\boldsymbol{(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = \sin [2 \log(1 + x)]}$

Q48. Solve $\boldsymbol{(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = 4coslog(1 + x)}$

Q49. Solve $\boldsymbol{x^3 \frac{d^3y}{dx^3} + x^2\frac{d^2y}{dx^2} + 2y = 10}$

Q50. Solve $\boldsymbol{(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1}$

Q51. Solve $\boldsymbol{x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = (1 + x)^4}$

Co4: To solve partial differential equations with its applications in Laplace equation, Heat & Wave equation

1. Using the method of separation of variable Solve $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$ (RTU 2018)
2. Solve the following equation by the method of separation of variable: $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$, given $u = 3e^{-y} - e^{-5y}$ when $x = 0$
3. Solve by the method of separation of variables: $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$, $u(x, 0) = 4e^{-x}$
4. Solve the equation by the method of separation of variables: $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial y} + 2u$, given that $u = 0$ and $\frac{\partial u}{\partial x} = 1 + e^{-3y}$ when $x = 0$ for all values of y. (RTU 2019)
5. Using the method of separation of variables Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x, 0) = 6e^{-3x}$
6. A tightly stretched string with fixed ends points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 sin^3\left(\frac{\pi x}{l}\right)$. if is released from rest find the displacement $y(x, t)$.
7. Write the mathematical form of one dimensional wave equation and discuss its solution.
8. An infinitely long plane uniform plate is bounded by two parallel edges and an end at right angle to them. The breadth is π. This end is maintained at temperature u_0 at all points and other edges are at zero temperature. Determine the temperature at any point of the plate in steady-state.
9. Write the mathematical form of one dimensional heat equation and discuss its solution.
10. Write the mathematical form of Laplace Equation and discuss its solution.
11. A bar 1000 cm long, with insulated sides, has its ends kept at 0C and 100C until steady state condition prevail. Two ends are suddenly insulated and kept so. Find the temp. Distribution.
12. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$
13. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with boundary conditions u(x,0)= 3sinnπx , u(l,o)=0, u(l,t)=0 .
14. The point of trisection of a string are pulled aside through the same distance on opposite side of the position of equilibrium and the string is released from the rest . Derive tan expression for the displacement of the string at subsequent time and show that the midpoint of the string always remains at rest.
15. A string is stretched and fastened to two point’s l apart. Motion is started
16. By displacing the string in the form y$y = a \sin(\frac{\pi x}{l})$ from it is released at t=0. Find the displacement at any time t.
17. Discuss the method of separation of variables to solve partial differential equations.
18. Discuss the solution of two dimensional heat equations.
19. Two ends A and B of a rod 20 cm long have temp 30C and 80C until steady state prevails. the temp of the ends are changed to 40C and 60C respectively .find the temp distribution in the rod at any time t.
20. Two ends A and B of a rod 10 cm long have temp 50C and 100C until steady state prevails. the temp of the ends are changed to 90C and 60C respectively .find the temp distribution in the rod at any time t.

21. Solve $\sqrt{p}+\sqrt{q}=1$
22. Form the partial differential equation by eliminating the arbitrary function from $z = f(x^2+y^2)$.
23. Solve $(y^2+z^2-x^2)p-2xyq=-2xz$ [GATE (EC) 2014]
24. Solve $y=2px+p^{2n}$
25. Solve $y=p^2x+p^4$
26. Solve $y=2px-xp^2$
27. Solve $y-2px=tan^{-1}(xp^2)$
28. Solve $y=x+atan^{-1}p$
29. Solve $y=2px+p^n$
30. Solve $y=2px+y^2p^3$
31. Solve $p=tan\left(x-\frac{p}{1+p^2}\right)$ [GATE (CS) 2014]
32. Solve $p = (q\,y + z)^2$
33. Solve $(x^2-yz)\,p + (y^2 - z\,x)q = z^2 - x\,y$
34. Solve $(y^2+z^2-x^2)\,p - 2xyq = 2zx$
35. Find the complete integral of $p\,x + q\,y = p\,q$
36. Solve $p^2+q^2-2px-2qy+2xy=0$
37. Solve $y=2px+y^2p^3$
38. Solve $p=tan\left(x-\frac{p}{1+p^2}\right)$ where $p=\frac{dy}{dx}$ (RTU 2016)
39. Solve $p^3+2xp^2-y^2p^2-2xy^2p=0$
40. Solve $p= \cos(y-px)$
41. Solve $\sin px \cos y = \cos px \sin y + p$ (RTU 2015)
42. Solve $p= \cos(y-px)$
43. Solve $(y^2+z^2-x^2)\,p - 2xyq = 2zx$
44. Solve $y=pxy+x^4p^2$
45. Solve $p^2+(x-e^x)p-xe^x=0$
46. Solve $y=-px+x^4p^2$
47. Solve $9(y+xp\log p)=(2+3\log p)p^3$
48. Solve $p^2+q^2=x+y$
49. Solve: $pxy + pq + qy = yz$ by Charpit 's method (RTU2016)
50. Solve: $q=3p^2$