JAIPUR ENGINEERING COLLEGE & RESEARCH CENTRE

TUTORIAL SHEET

Year: B. Tech. I Year II Semester

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

TUTORIAL SHEET NO.1

Q.1Determine the rank of the following matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$

Q.2Find the rank of the following matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ b+c & c+a & a+b \\ bc & ca & ab \end{bmatrix}$

TUTORIAL SHEET NO.2

Q.3 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.

Q.4Investigate 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

TUTORIAL SHEET NO.3

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

Q.6Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

TUTORIAL SHEET NO.4

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

Q.8Find the Eigen value and Eigen vector of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

TUTORIAL SHEET NO.5

Q.9Verify 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) $\begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$

(ii)

Q.10 Using the Cayley-Hamilton theorem , find the inverse of

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

TUTORIAL SHEET NO.6

Q.11Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. hence compute A^{-1}.also find the matrix represented by $A^5 - 5A^4 + 3A^3 + 6A^2 - 6A + 2I$.

Q.12State and explain the application of Cayley-Hamilton theorem.

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TUTORIAL SHEET

Year: B. Tech. I Year II Semester

Subject: Engineering Mathematics - II

Session: 2019-20

CO2: To solve Ordinary D.E of first order, first degree and first order higher degree using various methods.

TUTORIAL SHEET NO.1

1. Solve $y = 2px + y^2p^3$
2. Solve $p = tan\left(x - \frac{p}{1+p^2}\right)$ where $p = \frac{dy}{dx}$

TUTORIAL SHEET NO.2

3. Solve $p^3 + 2xp^2 - y^2p^2 - 2xy^2p = 0$
4. Solve $x^2\left(\frac{dy}{dx}\right)^2 - 2xy\left(\frac{dy}{dx}\right) + 2y^2 - x^2 = 0$

TUTORIAL SHEET NO.3

5. Solve $p^2 + (x - e^x)p - xe^x = 0$
6. Solve $y = -px + x^4p^2$

TUTORIAL SHEET NO.4

7. Solve $9(y + xp\log p) = (2 + 3\log p)p^3$
8. Solve $x^2\left(\frac{dy}{dx}\right)^4 + 2x\frac{dy}{dx} - y = 0$

TUTORIAL SHEET NO.5

9. Solve $y = 2px + p^n$
10. Solve $y = 2px + y^2p^3$

TUTORIAL SHEET NO.6

11. Solve $p = tan\left(x - \frac{p}{1+p^2}\right)$
12. Solve$(y^2+z^2-x^2)p - 2xyq = 2zx$

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TUTORIAL SHEET

Year: B. Tech. I Year II Semester

Subject: Engineering Mathematics - II

Session: 2019-20

CO-3: To find the complete solution of D.E of higher order with constant coefficient & variable coefficients & their methods of solution.

TUTORIAL SHEET NO.1

Q1.Find the series solution of $(1-x^2)\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} + y = 0$

Q2. Find the series solution of $x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + x^2y = 0$.

TUTORIAL SHEET NO.2

Q3. Find the series solution of $2x^2\frac{d^2y}{dx^2} + (2x^2 - x)\frac{dy}{dx} + y = 0$. .

Q4. Find the series solution of $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - 1)\, y = 0$.

TUTORIAL SHEET NO.3

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

Q6. Find the series solution of $(1-x)\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} - y = 0$

TUTORIAL SHEET NO.4

Using Method of Variation of Parameter:.

Q7.Solve $x^3\frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} + 2y = 10(x + \frac{1}{x})$

Q8.Solve $(2+3x)^2\frac{d^2y}{dx^2} + 3(2+3x)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$

TUTORIAL SHEET NO.5

Using Method of Variation of Parameter:

Q9.Solve $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin[2\log(1+x)]$

Solve the following Differential Equations:

Q10.Solve $(x^3y^2 + x)dy + (x^2y^3 - y)dx = 0$

TUTORIAL SHEET NO.6

Solve the following Differential Equations:

Q11.Solve $\left(xy^2 - e^{1/x^3}\right)dx - x^2ydy = 0$

Q12.Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$

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TUTORIAL SHEET

Year: B. Tech. I Year II Semester

Subject: Engineering Mathematics - II

Session: Session: 2019-20

Co 4: To solve partial differential equations with its applications in Laplace equation, Heat & Wave equation

TUTORIAL SHEET NO.1

Q.1 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 $x=0$

Q.2 Solve by the method of separation of variables: $3\frac{\partial u}{\partial x}+2\frac{\partial u}{\partial y}=0,\ u(x,0)=4e^{-x}$

TUTORIAL SHEET NO.2

Q.3 Write the mathematical form of one dimensional heat equation and discuss its solution.

Q.4 Write the mathematical form of Laplace Equation and discuss its solution.

TUTORIAL SHEET NO.3

Q.5 Using the method of separation of variables Solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$ where $u(x,0)=6e^{-3x}$

Q.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 $y(x,t)$.

TUTORIAL SHEET NO.4

Q.7 Discuss the method of separation of variables to solve partial differential equations.

Q.8 Discuss the solution of two dimensional heat equation.

TUTORIAL SHEET NO.5

Q.9 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.

Q.10 Find the temp u(x,t) in a bar which is perfectly insulated whose ends are at Tem 0C and initial temp is $f(x) = x(10 - x)$ given that its length is 10 cmconstant and cross section 1 cm^3. Density 10.6 gm/cm^3 . thermal conductivity 1.04 cal/cm, specific heat 0.056 cal/gm deg.

TUTORIAL SHEET NO.6

Q.11 Using the method of separation of variable Solve $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$

Q.12 Write the mathematical form of one dimensional heat equation and discuss its solution.