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# Table of Contents



Note : Remove “Table of Content” before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

# 18MAT11 : Calculus and Linear Algebra

## A. COURSE INFORMATION

### 1. Course Overview

| | | | |
|---|---|---|---|
| Degree: | BE | Program: | All Branches |
| Year / Semester : | 2019/ I | Academic Year: | 2019-20 |
| Course Title: | Calculus and Linear Algebra | Course Code: | 18MAT11 |
| Credit / L-T-P: | 4/ 3-2-0 | SEE Duration: | 180 Minutes |
| Total Contact Hours: | 50 | SEE Marks: | 60 Marks |
| CIA Marks: | 40 | Assignment | 1 / Module |
| Course Plan Author: | Mrs.Smitha N | Sign | Dt:03-08-2019 |
| Checked By: | Dr.Puttaraju C | Sign | Dt: |

### 2. Course Content

| Module | Module Content | Teaching Hours | Module Concepts | Blooms Level |
|---|---|---|---|---|
| 1 | Angle problems on polar form, pedal form, radius of curvature, evolutes and involutes. | 10 | Bentness of the curve. | L3 |
| 2 | Taylor's and Maclaurin's series, Indeterminate forms | 5 | Infinite series | L3 |
| 2 | Partial Differentiation, Maxima and minima and its applications. Jacobians. | 5 | Partial Differentiation | L3 |
| 3 | Evaluation of double and triple integrals and its applications.Beta and Gamma functions. | 10 | Area and volume | L4 |
| 4 | Methods to solve ODE and its applications. | 10 | ODE | L3 |
| 5 | Rank of matrices and different methods to solve system of equations, Eigen values and eigen vectors of square matrix and its diagonalizaion. | 10 | Matrix Theory | L3 |

### 3. Course Material

| Module | Details | Available |
|---|---|---|
| 1 | Text books: | |
| | 1.B.S.Grewal: Higher Engineering Mathematics, Khanna publishers, 43rd Ed.,2015. | In Dept |
| | 2.E.Kreyszig: Advanced Engineering Mathematics,John Wiley & Sons, 10th Ed. (Reprint),2016. | In Dept |
| 2 | Reference books: | |
| | 1. C Ray Wylie, Louis C Barrett: "Advanced Engineering Mathematics",6th Edition, 2.McGraw-Hill Book Co.,New york,1995. | Not Available |
| | 2.James Stewart:"Calculus- Early Transcendentals", Cengage Learning India Private Ltd.,2017. | Not Available |
| | 3.B.V.Ramana:"Higher Engineering Mathematics" 11th Edition Tata McGraw-Hill,2010. | In Dept |
| | 4.Srimanta Pal & Subobh C Bhunia: "Engineering Mathematics", Oxford UniversityPress, 3rd Reprint, 2016. | Not Available |
| | 5.Gupta C B, Singh S R and Mukesh Kumar:"Engineering Mathematics for SemesterI and II, Mc-Graw Hill Education(India)Pvt.Ltd., 2015. | Not Available |
| | | |

### 4. Course Prerequisites

| SNo | Course Code | Course Name | Module / Topic / Description | Sem | Remarks | Blooms Level |
|---|---|---|---|---|---|---|

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Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

## B. OBE PARAMETERS

### 1. Course Outcomes

| # | COs | Teach. Hours | Concept | Instr Method | Assessment Method | Blooms' Level |
|---|---|---|---|---|---|---|
| CO1 | Apply calculus to determine the bentness of the curve and solve the problems. | 10 | Bentness of the curve. | Lecture | Assignment and Slip Test | L3 Apply |
| CO2 | Apply Taylor;s method using function of the one variable to get an infinite series. | 5 | Infinite series | Lecture | Assignment and Slip Test | L3 Apply |
| CO3 | Apply partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobians. | 5 | Partial Differentiation | Lecture | Assignment and Slip Test | L3 Apply |
| CO4 | Analyze the concept of change of order of integration using multiple integrals to compute area and volume | 10 | Area and volume | Lecture | Assignment and Slip Test | L4 Analyze |
| CO5 | Apply the first order linear/ non-linear differential equation analytically using standard methods. | 10 | Ordinary Differential Equation. | Lecture | Assignment and Slip Test | L3 Apply |
| CO6 | Apply the elementary matrix theory to solve the system of linear equations and compute eigen values and eigen vectors for diagonalization. | 10 | Matrix Theory | Lecture | Assignment and Slip Test | L3 Apply |
| | | | | | | |
| - | **Total** | **50** | - | - | - | - |

Note: Identify a max of 2 Concepts per Module. Write 1 CO per concept.

### 2. Course Applications

| SNo | Application Area | CO | Level |
|---|---|---|---|
| 1 | Polar curves are used to determine actual illumination of a surface. | CO1 | L3 |
| 2 | Taylor's series is used as a tool in computational science and approximation. | CO2 | L3 |
| 3 | Partial differentiation is used to study the nature of heat-wave equations and its applications in thermodynamics. | CO3 | L3 |
| 4 | Multiple integrals are used to compute area and volume. | CO4 | L4 |
| 5 | Solve first order linear/ non-linear differential equation analytically using standard methods. | CO5 | L3 |
| 6 | Matrix theory is used to solve the system of linear equations and compute eigen values and eigen vectors required for matrix diagonalization process. | CO6 | L3 |

Note: Write 1 or 2 applications per CO.

### 3. Articulation Matrix

**(CO – PO MAPPING)**

| - | Course Outcomes | Program Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO 6 | PO7 | PO 8 | PO9 | PO1 0 | PO1 1 | PO1 2 | Level |
| CO1 | Apply calculus to determine the bentness of the curve and solve | √ | √ | √ | | | | | | | | | | L3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | the problems. | | | | | | | | | | | | | |
| CO2 | Apply Taylor;s method using function of the one variable to get an infinite series. | √ | √ | | | | | | | | | | | L3 |
| CO3 | Apply partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobians. | √ | √ | | | | | | | | | | | L3 |
| CO4 | Analyze the concept of change of order of integration using multiple integrals to compute area and volume | √ | √ | | | | | | | | | | | L4 |
| CO5 | Apply the first order linear/ non-linear differential equation analytically using standard methods. | √ | √ | | | | | | | | | | | L3 |
| CO6 | Apply the elementary matrix theory to solve the system of linear equations and compute eigen values and eigen vectors for diagonalization. | √ | √ | √ | | | | | | | | | | L3 |
| **Note: Mention the mapping strength as 1, 2, or 3** | | | | | | | | | | | | | | |

## 4. Mapping Justification

| Mapping | | Justification | Mapping Level |
|---|---|---|---|
| **CO** | **PO** | **-** | **-** |
| CO1 | PO1 | Apply the knowledge of bentness of curve. | L3 |
| CO1 | PO2 | Analyze complex engineering problem using radius of curve. | L4 |
| CO1 | PO3 | Apply the knowledge gained to design the railway tracks. | L3 |
| CO2 | PO1 | Apply the knowledge of Taylor's series. | L3 |
| CO2 | PO2 | It is used in power flow analysis of electrical power systems. | L4 |
| CO3 | PO1 | Apply the knowledge of partial differential equations which serves as models for physical processes. | L3 |
| CO3 | PO2 | To analyze physical processes such as mechanical vibrations, transfer phenomena. | L4 |
| CO4 | PO1 | Apply the knowledge of double and triple integrals to solve complex engineering problems. | L3 |
| CO4 | PO2 | Analyze complex engineering problems such as finding the area and volume of surfaces. | L4 |
| CO5 | PO1 | Apply the knowledge of ordinary differential equations to find the solution of complex engineering problems. | L3 |
| CO5 | PO2 | Used to analyze flow of water and its related properties in fluid mechanics. | L4 |
| CO6 | PO1 | Apply the knowledge of eigen values and vectors to solve complex engineering problems. | L3 |
| CO6 | PO2 | Eigen value analysis is used in analyzing the vibration of the car caused due to music system. | L4 |
| CO6 | PO3 | Eigen value analysis is used in designing the car stereo system. | L4 |

Note: Write justification for each CO-PO mapping.

## 5. Curricular Gap and Content

| SNo | Gap Topic | Actions Planned | Schedule Planned | Resources Person | PO Mapping |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| | | | | | |
| | | | | | |

Note: Write Gap topics from A.4 and add others also.

## 6. Content Beyond Syllabus

| SNo | Gap Topic | Actions Planned | Schedule Planned | Resources Person | PO Mapping |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Note: Anything not covered above is included here.

# C. COURSE ASSESSMENT

## 1. Course Coverage

| Module # | Title | Teaching Hours | No. of question in Exam | | | | | | CO | Levels |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | CIA-1 | CIA-2 | CIA-3 | Asg | Extra Asg | SEE | | |
| 1 | Differential Calculus -1 | 10 | 2 | - | 1 | | | 2 | CO1 | L3 |
| 2 | Differential Calculus -2 | 10 | 2 | - | 1 | | | 2 | CO2, CO3 | L3 |
| 3 | Integral Calculus | 10 | - | - | 1 | | | 2 | CO4 | L4 |
| 4 | Ordinary Differential Equations. | 10 | - | 2 | - | | | 2 | CO5 | L3 |
| 5 | Linear Algebra | 10 | - | 2 | 1 | | | 2 | CO6 | L3 |
| **-** | **Total** | **50** | **4** | **4** | **4** | | | **10** | **-** | **-** |

Note: Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

## 2. Continuous Internal Assessment (CIA)

| Evaluation | Weightage in Marks | CO | Levels |
|---|---|---|---|
| CIA Exam – 1 | 30 | CO1,CO2,CO3 | L3 |
| CIA Exam – 2 | 30 | CO5,CO6 | L4 |
| CIA Exam – 3 | 30 | CO1,CO2,CO3,CO4,CO6 | L4 |
| | | | |
| Assignment - 1 | 10 | CO1,CO2,CO3 | L3 |
| Assignment - 2 | 10 | CO5,CO6 | L4 |
| Assignment - 3 | 10 | CO1,CO2,CO3,CO4,CO6 | L4 |
| | | | |
| Seminar - 1 | - | - | - |
| Seminar - 2 | - | - | - |
| Seminar - 3 | - | - | - |
| | | | |
| Other Activities – define – | - | - | - |

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|---|---|---|---|
| Slip test | | | |
| **Final CIA Marks** | **40** | - | - |
| | | | |

Note : Blooms Level in last column shall match with A.2 above.

## D1. TEACHING PLAN - 1

### Module - 1

| Title: | Differential Calculus-1 | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | - | **Blooms** |
| - | The student should be able to: | - | **Level** |
| 1 | Apply calculus to determine the bentness of the curve and solve the problems. | CO1 | L3 |
| **b** | ***Course Schedule*** | - | - |
| **Class No** | **Module Content Covered** | **CO** | **Level** |
| 1 | Review of elementary differential calculus. | CO1 | L3 |
| 2 | Polar curves-Angle between the radius vector and tangent. | CO1 | L3 |
| 3 | Angle between two curves. | CO1 | L3 |
| 4 | Pedal equation | CO1 | L3 |
| 5 | Radius of curvature- Cartesian form | CO1 | L3 |
| 6 | Radius of curvature- Polar form | CO1 | L3 |
| 7 | Centre and circle of curvature. | CO1 | L3 |
| 8 | Applications to evolutes | CO1 | L3 |
| 9 | Applications to involutes | CO1 | L3 |
| 10 | Additional Problems. | CO1 | L3 |
| | | | |
| **c** | **Application Areas** | **CO** | **Level** |
| 1 | Polar curves are used to determine actual illumination of a surface. | CO1 | L3 |
| | | | |
| **d** | **Review Questions** | - | - |
| 1 | Find the nth derivative of $e^{ax}\cos(bx+c)$. | CO1 | L3 |
| 2 | If $y=e^{m\sin^{-1}x}$ then prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-(m^2+n^2)y_n=0$ | CO1 | L3 |
| 3 | Find the pedal equation of the curve $r^m=a^m(\cos m\theta+\sin m\theta)$. | CO1 | L3 |
| 4 | Find the angle of intersection of the curves $r=a\log\theta$ ,$r=\frac{a}{\log\theta}$ | CO1 | L3 |
| 5 | Show that the pairs of curves $r=a(1+\cos\theta)$ &$r=b(1-\cos\theta)$ intersect orthogonally . | CO1 | L3 |
| 6 | Find the pedal equation of the curve $r=a(1+\cos\theta)$ | CO1 | L3 |
| 7 | Find the angle between the radius vector and the tangent vector to the curve $r=a(1-\cos\theta)$. | CO1 | L3 |
| 8 | Find the pedal equation of the curve $\frac{2a}{r}=¿(1-\cos\theta)$ | CO1 | L3 |
| 9 | Show that the radius of curvature at any point ' $\theta$ ' to the curve $x=a(\theta+\sin\theta)$ ,$y=a(1-\cos\theta)$ is $4a\cos(\frac{\theta}{2})$. | CO1 | L3 |
| 10 | Derive an expression for radius of curvature in case of the polar curve $r=f(\theta)$. | CO1 | L3 |
| 11 | Find the radius of curvature at the point ' $t$ ' on the curve $x=a(t+\sin t)$ ,$y=a(1-\cos t)$. | CO1 | L3 |
| | | | |
| **e** | **Experiences** | - | - |
| 1 | | | |

| | | | |
|---|---|---|---|
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

## Module – 2

| Title: | Differential Calculus-2 | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | - | **Blooms** |
| - | The student should be able to: | - | **Level** |
| 1 | Apply Taylor;s method using function of the one variable to get an infinite series. | CO2 | L3 |
| 2 | Apply partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobians. | CO3 | L3 |
| | | | |
| **b** | ***Course Schedule*** | - | - |
| **Class No** | **Module Content Covered** | **CO** | **Level** |
| 11 | Taylor's and Maclaurin's series expansion | CO2 | L3 |
| 12 | Problems | CO2 | L3 |
| 13 | Indeterminate forms | CO2 | L3 |
| 14 | Problem solving | CO2 | L3 |
| 15 | Total derivatives-differentiation of composite functions | CO3 | L3 |
| 16 | Maxima and minima for a function of two variables. | CO3 | L3 |
| 17 | Method of Lagrange's multipliers | CO3 | L3 |
| 18 | Application of maxima and minima with examples. | CO3 | L3 |
| 19 | Jacobians | CO3 | L3 |
| 20 | Problems on jacobians | CO3 | L3 |
| | | | |
| **c** | **Application Areas** | **CO** | **Level** |
| 1 | Taylor's series is used as a tool in computational science and approximation. | CO2 | L3 |
| 2 | Partial differentiation is used to study the nature of heat-wave equations and its applications in thermodynamics. | CO3 | L3 |
| | | | |
| **d** | **Review Questions** | - | - |
| 12 | Expand $\tan(\frac{\pi}{4}+x)$ by using the maclaurin's series expansion up to the terms containing $x^4$ | CO3 | L1 |
| 13 | Expand log(secx) by using the maclaurin's series expansion up to the terms containing $x^4$ | CO3 | L3 |
| 14 | Evaluate $\lim_{x\to 0}\left(\frac{a^x+b^x+c^x+d^x}{4}\right)^{\frac{1}{x}}$ | CO3 | L2 |
| 15 | Evaluate $\lim_{x\to 0}\frac{sinx\sin^{-1}(x)}{x^2}$ | CO3 | L3 |
| 16 | Evaluate $\lim_{x\to 0}(cosx)^{\frac{1}{x^2}}$ | CO3 | L2 |
| 17 | If $u=f\left(\frac{y-x}{xy},\frac{z-x}{xz}\right)$ then prove that $x^2\frac{\partial u}{\partial x}+y^2\frac{\partial u}{\partial y}+z^2\frac{\partial u}{\partial z}=0$ | CO3 | L3 |
| 18 | Find $J\left(\frac{u,v,w}{x,y,z}\right)$ where $u=x^2+y^2+z^2$ , $v=xy+yz+zx$ , $w=x+y+z$. | CO3 | L2 |

| | | | |
|---|---|---|---|
| 19 | u=$\frac{xy}{z}$ , v=$\frac{yz}{x}$ and w¿ $\frac{xz}{y}$ find $J\left(\frac{u,v,w}{x,y,z}\right)$ | CO3 | L3 |
| | | | |
| **e** | **Experiences** | - | - |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | CO.3 | L3 |
| 5 | | | |

## E1. CIA EXAM – 1

### a. Model Question Paper - 1

| Crs Code: | 18MAT11 | Sem: | I | Marks: | 30 | Time: | 75 minutes | | |
|---|---|---|---|---|---|---|---|---|---|
| Course: | Calculus and Linear Algebra | | | | | | | | |
| **-** | **-** | **Note: Answer any 3 questions, each carry equal marks.** | | | | | **Marks** | **CO** | **Level** |
| 1 | a | With usual notations prove that $\tan \phi = r\frac{d\theta}{dr}$ | | | | | 5 | CO1 | L3 |
| | b | Find the pedal equation of the curve $r^n = a^n \cos n\theta$ | | | | | 5 | CO1 | L3 |
| | c | Find the radius of curvature at the point $\left(\frac{3a}{2},\frac{3a}{2}\right)$ of the folium $x^3+y^3=3axy$ | | | | | 5 | CO1 | L3 |
| | | OR | | | | | | | |
| 2 | a | Find the angle of intersection of the curves $r=a\log\theta$ , $r=\frac{a}{\log\theta}$ | | | | | 5 | CO1 | L3 |
| | b | Find the pedal equation of the curve $r^m=a^m(\cos m\theta+\sin m\theta)$ | | | | | 5 | CO1 | L3 |
| | c | Find the centre and circle of curvature for $xy=c^2$ at (c,c) | | | | | 5 | CO1 | L3 |
| 3 | a | Obtain the Taylor's expansion of logx about x=1 upto the term containing $4^{th}$ degree and hence obtain log(1.1). | | | | | 5 | CO2 | L3 |
| | b | Evaluate $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$ | | | | | 5 | CO2 | L3 |
| | c | If x= rsinθcosø, y=rsinθsinø, z=rsinθ , find $J\left(\frac{x,y,z}{r,\theta,\phi}\right)$ | | | | | 5 | CO3 | L3 |
| | | OR | | | | | | | |
| 4 | a | Expand log(secx) upto to sixth degree using Maclaurin's Expansion | | | | | 5 | CO2 | L3 |
| | b | Evaluate $\lim_{x\to 0}\left(\frac{1}{x^2}-\frac{1}{\sin^2(x)}\right)$ | | | | | 5 | CO2 | L3 |
| | c | If $u=x^2+y^2+z^2, v=xy+yz+zx, w=x+y+z, find \frac{\partial(u,v,w)}{\partial(x,y,z)}$ | | | | | 5 | CO3 | L3 |

### b. Assignment -1

Note: A distinct assignment to be assigned to each student.

| Model Assignment Questions | | | | | | |
|---|---|---|---|---|---|---|
| Crs Code: | 18MAT11 | Sem: | I | Marks: | 10 | Time: |
| Course: | Calculus and Linear Algebra | | | | | |
| Note: Each student to answer 3 assignments. Each assignment carries equal mark. | | | | | | |

| SNo | USN | Assignment Description | Marks | CO | Level |
|---|---|---|---|---|---|
| 1 | | If X= tan(logy) ,show that $(1+x^2)y_{n+1}+(2nx-1)y_n+n(n-1)y_{n-1}=0$ | 5 | CO1 | L3 |
| 2 | | Using the Maclaurin's series $prove\ that\ \sqrt{1+\sin 2x}$ =1+ x | 5 | CO2 | L3 |

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| | | $\frac{-(x^2)}{(2)}+\frac{(x^3)}{6}+\frac{x^4}{24}$ -…… , | | | |
| 3 | | Expand f(x)=sin($e^x$-1) in powers of x up to the terms containing $x^4$ | 5 | CO2 | L3 |
| 4 | | Find the nth derivative of $y=e^{2x}\sin x\cos^2 x$ | 5 | CO1 | L3 |
| 5 | | Expand log(secx) by using the maclaurin's series expansion up to the terms containing $x^4$ | 5 | | L3 |
| 6 | | Prove that with usual notations $\frac{1}{p^2}=u^2+$¿ | 5 | CO1 | L3 |
| 7 | | Expand tan($\frac{\pi}{4}$ +x) by using the maclaurin's series expansion up to the terms containing $x^4$ | 5 | CO2 | L3 |
| 8 | | Expand log(1+sinx) in powers of x by using the Maclaurin's series expansion up to the terms containing $x^4$ | 5 | CO2 | L3 |
| 9 | | Find the maclaurin's series expansion of $\tan^{-1}(x)$, up to the fifth degree term of x. | 5 | CO2 | L3 |
| 10 | | Find the pedal equation of the curve $r^m=a^m(\cos m\theta+\sin m\theta)$. | 5 | CO1 | L3 |
| 11 | | Find the angle of intersection of the curves $r=a\log\theta$ ,$r=\frac{a}{\log\theta}$ | 5 | CO1 | L3 |
| 12 | | Find the pedal equation of the curve $r^n=a^n\cos n\theta$ | 5 | CO1 | L3 |
| 13 | | Show that the pairs of curves $r=a(1+\cos\theta)$ &$r=b(1-\cos\theta)$ intersect orthogonally | 5 | CO1 | L3 |
| 14 | | Find the pedal equation of the curve $r=a(1+\cos\theta)$ | 5 | CO1 | L3 |
| 15 | | Evaluate $\lim_{x\to 0}\left(\frac{a^x+b^x+c^x+d^x}{4}\right)^{\frac{1}{x}}$ | 5 | CO3 | L3 |
| 16 | | Evaluate i) $\lim_{x\to 0}\frac{\sin x\sin^{-1}(x)}{x^2}$ ii) $\lim_{x\to 0}\left(\frac{a^x+b^x+c^x}{3}\right)^{\frac{1}{x}}$ | 5 | CO3 | L3 |
| 17 | | Evaluate: i) $\lim_{x\to\frac{\pi}{2}}(2x\tan x-\pi\sec x)$ ii) $\lim_{x\to 0}\left(2-\frac{x}{a}\right)^{\tan\left(\frac{\pi x}{2a}\right)}$ | 5 | CO3 | L3 |
| 18 | | If x+ y+ z=u , y+ z=v,z=uvw show that $J\left(\frac{x,y,z}{u,v,w}\right)$=uv. | 5 | CO3 | L3 |
| 19 | | If $u=f\left(\frac{y-x}{xy},\frac{z-x}{xz}\right)$ then prove that $x^2\frac{\partial u}{\partial x}+y^2\frac{\partial u}{\partial y}+z^2\frac{\partial u}{\partial z}$ =0 | 5 | CO3 | L3 |
| 20 | | Find $J\left(\frac{u,v,w}{x,y,z}\right)$ where $u=x^2+y^2+z^2$ , v=xy + yz + zx , w=x+y+z | 5 | CO3 | L3 |
| 21 | | If u=$\frac{xy}{z}$ , v=$\frac{yz}{x}$ and w¿ $\frac{xz}{y}$ find $J\left(\frac{u,v,w}{x,y,z}\right)$ | 5 | CO3 | L3 |
| 22 | | If $u=x^2-y^2$ , v=2xy, Find $J\left(\frac{u,v}{x,y}\right)$; ii) $x^2+xy+y^3=2$ , find $\frac{d(yx^3)}{dx}$ | 5 | CO3 | L3 |
| 23 | | If $u=f(x-y,y-z,z-x)$ prove that $u_x+u_y+u_z=0$ | 5 | CO3 | L3 |
| 24 | | If u=log($x^3$+ $y^3$+ $z^3$ -3xyz), then prove that$\frac{\partial u}{\partial x}+$¿ $\frac{\partial u}{\partial y}+$¿ $\frac{\partial u}{\partial z}=$¿ $\frac{3}{x+y+z}$. | 5 | CO3 | L3 |

| | | | | | |
|---|---|---|---|---|---|
| 25 | | If u=xlog(xy) where $x^3+ y^3+ 3xy=1$ , find $\frac{dy}{dx}$ and hence find $\frac{du}{dx}$ | 5 | CO3 | L3 |
| 26 | | Using the Taylor's theorem, expand $e^x \cos y$ about (1, $\frac{\pi}{4}$) up to second degree terms | 5 | CO2 | L3 |

## D2. TEACHING PLAN - 2

### Module – 5

| Title: | Linear Algebra | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | - | **Blooms** |
| - | The student should be able to: | - | **Level** |
| 1 | Apply the elementary matrix theory to solve the system of linear equations and compute eigen values and eigen vectors for diagonalization. | CO3 | L3 |
| | | | |
| **b** | ***Course Schedule*** | | |
| **Class No** | **Module Content Covered** | **CO** | **Level** |
| 1 | Rank of matrix by echelon form | CO3 | L3 |
| 2 | Problems on finding rank of matrices. | CO3 | L3 |
| 3 | Solution of system of linear equations- Gauss elimination method | CO3 | L3 |
| 4 | Gauss Jordan Method problems. | CO3 | L3 |
| 5 | Approximate solution by Gauss Seidal Method | CO3 | L3 |
| 6 | Additional problems on system of equations. | CO3 | L3 |
| 7 | Eigen values and vectors problems. | CO3 | L3 |
| 8 | Rayleigh's power method problems. | CO3 | L3 |
| 9 | Problems on Diagonalization of square matrix. | CO3 | L3 |
| 10 | Additional problems. | CO3 | L3 |
| | | | |
| **c** | **Application Areas** | **CO** | **Level** |
| 1 | Matrix theory is used to solve the system of linear equations and compute eigen values and eigen vectors required for matrix diagonalization process. | CO6 | L3 |
| | | | |
| **d** | **Review Questions** | - | - |
| 1 | Use elementary row transformations , find the rank of the matrix $\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$ | CO6 | L3 |
| 2 | Applying Gauss Jordan method solve 2x+3y-z=5, 4x+4y-3z=3, 2x-3y+2z=2. | CO6 | L3 |
| 3 | Apply Gauss-elimination method to solve the following equations: 2x-y+3z=1; -3x+4y-5z=0; x+3y-6z=0. | CO6 | L3 |
| 4 | Apply Gauss-elimination method to solve the following equations: x-2y+3z=2; 3x-y+4z=4; 2x+y-2z=5 | CO6 | L3 |
| 5 | Reduce the matrix, A $\begin{bmatrix} 11 & -4 & 7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{bmatrix}$ into a daiagonal matrix | CO6 | L3 |
| 6 | Solve using the Gauss Jordan method. x+y+z=9; x-2y+3z=8; 2x+y-z=3 | CO6 | L3 |
| 7 | Find the eigen values and eigen vector corresponding to the largest eigen value of the matrix A = $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ | CO6 | L3 |

| | | | |
|---|---|---|---|
| 8 | If P= $\begin{bmatrix} -1 & 1 & 1 \\ 0 & -1 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ is a modal matrix of the matrix A = $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ and the inverse of P is $P^{-1}$ = $\begin{bmatrix} -3 & 0 & 3 \\ 2 & -2 & 2 \\ 1 & 2 & 1 \end{bmatrix}$, then transform A into diagonal form and hence find $A^4$ | CO6 | L3 |
| 9 | Show that the transformation $y_1=2x_1-2x_2-x_3$ , $y_2=-4x_1+5x_2+3x_3$ , $y_3=x_1-x_2-x_3$ is regular and find the inverse transformation | CO6 | L3 |
| 10 | Diagonalize the matrix, A= $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ | CO6 | L3 |
| 11 | Find all the eigen values for the matrix, A= $\begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$ | CO6 | L3 |
| | | | |
| **e** | **Experiences** | - | - |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

## Module – 4

| Title: | Ordinary Differential Equations | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | - | **Blooms** |
| - | The student should be able to: | - | **Level** |
| 1 | Apply the first order linear/ non-linear differential equation analytically using standard methods. | CO3 | L3 |
| | | | |
| **b** | ***Course Schedule*** | | |
| **Class No** | **Module Content Covered** | **CO** | **Level** |
| 1 | Problems on exact and reducible to exact equations. | CO3 | L3 |
| 2 | Additional problems. | CO3 | L3 |
| 3 | Bernoulli's equation problems. | CO3 | L3 |
| 4 | Applications of ODE's – Problems on orthogonal trajectories. | CO4 | L4 |
| 5 | Problems on Newton's law of cooling.. | CO4 | L4 |
| 6 | Problems on L-R circuits | CO4 | L4 |
| 7 | Additional problems on applications. | CO3 | L3 |
| 8 | Non linear differential equations- Solving problems on solvable on p. | CO3 | L3 |
| 9 | Problems on solvable for p | CO3 | L3 |
| 10 | Clairaut's equations and problems. | CO3 | L3 |
| | | | |
| **c** | **Application Areas** | **CO** | **Level** |
| 1 | Solve first order linear/ non-linear differential equation analytically using standard methods. | CO4 | L4 |
| | | | |
| **d** | **Review Questions** | - | - |
| 1 | Solve : $(x^2-4xy-2y^2)\,dx+(y^2-4xy-2x^2)\,dy=0$ | CO3 | L3 |

| | | | |
|---|---|---|---|
| 2 | Solve : $(x+2y^3)\frac{dy}{dx}=¿y$ | CO3 | L3 |
| 3 | Find the orthogonal trajectories of the family of the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2+\lambda}=1$ ('λ' being the parameter). | CO3 | L3 |
| 4 | Solve : $(x^2+ y^3+6x )dx+y^2xdy=0$. | CO3 | L3 |
| 5 | Find the orthogonal trajectories of $r^n sinn\theta=a^n$, with a parameter and solve | CO3 | L3 |
| 6 | Solve : $(y^3-3x^2 y)dx-(x^3-3xy^2) dy=0$. | CO3 | L3 |
| 7 | Find the orthogonal trajectories of the cardiods r=a(1-cos$\theta$), using the differential equation method | CO3 | L3 |
| 8 | Solve : $(1-x^2)\frac{dy}{dx}-¿xy=1$ | CO3 | L3 |
| 9 | Define orthogonal trajectories. Find the orthogonal trajectories of a system of co-axial circles $x^2+ y^2$ +2λy+c=2, where λ is the parameter | CO3 | L3 |
| 10 | Solve : $ydy+sin^2(\frac{x}{y}¿(xdy-ydx)¿0$ | CO3 | L3 |
| 11 | Solve: $\frac{dy}{dx}+xsin2y=x^3\cos^2 y$ | CO3 | L3 |
| | | | |
| **e** | **Experiences** | - | - |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

## E2. CIA EXAM – 2

### a. Model Question Paper - 2

| Crs Code: | 18MAT11 | Sem: | I | Marks: | 30 | Time: | 75 minutes | | |
|---|---|---|---|---|---|---|---|---|---|
| Course: | Calculus and linear algebra | | | | | | | | |
| - | - | Note: Answer any 2 questions, each carry equal marks. | | | | | | Marks | CO | Level |
| 1 | a | Find the Rank of a matrix A= $\begin{matrix}2&3&-1&-1\\1&-1&-2&-4\\3&1&3&-2\\6&3&0&-7\end{matrix}$ . | | | | | | 5 | CO6 | L3 |
| | b | Solve the following system of equations by Gauss-Jordan method:<br>x +y+z =9<br>x-2y+3z =8<br>2x+y-z =3. | | | | | | 5 | CO6 | L3 |
| | c | Find the largest eigen value and the corresponding eigen vector of the matrix A= $\begin{matrix}2&0&1\\0&2&0\\1&0&2\end{matrix}$ . | | | | | | 5 | CO6 | L3 |
| | | OR | | | | | | | | |
| 2 | a | Find the values of $a$ for which the system :<br>x+y+z =1<br>x+2y+4z =a<br>x+4y+10z =$a^2$ has a solution. Solve it in each case. | | | | | | 5 | CO6 | L3 |
| | b | Solve the system of equations by Gauss-Seidel method:<br>10x +y+z =12<br>x+10y+z =12 | | | | | | 5 | CO6 | L3 |

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| | | | | | |
|---|---|---|---|---|---|
| | | x+y+10z =12. | | | |
| | c | Reduce the matrix A= $\begin{matrix}-1 & 3\\ -2 & 4\end{matrix}$ to the diagonal form . | 5 | CO6 | L3 |
| 3 | a | Solve: $(4xy+3y^2-x)dx + x(x+2y)dy =0$. | 5 | CO5 | L3 |
| | b | Solve: $\frac{dy}{dx} + \frac{y}{x} = y^2x$. | 5 | CO5 | L3 |
| | c | Find the Orthogonal Trajectories of the family of parabolas $y^2=4ax$. | 5 | CO5 | L3 |
| | | OR | | | |
| 4 | a | Solve: $y(2xy+1)dx - xdy=0$. | 5 | CO5 | L3 |
| | b | Solve: $xy(1+xy^2)\frac{dy}{dx} =1$. | 5 | CO5 | L3 |
| | c | Find the Orthogonal Trajectories of the family of curves $r^n = a^n\cos n\theta$ . | 5 | CO5 | L3 |

## b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

| Model Assignment Questions | | | | | | |
|---|---|---|---|---|---|---|
| Crs Code: | 18MAT11 | Sem: | I | Marks: | 10 | Time: |
| Course: | Calculus and Linear Algebra | | | | | |
| Note: Each student to answer 3 assignments. Each assignment carries equal mark. | | | | | | |

| SNo | USN | Assignment Description | Marks | CO | Level |
|---|---|---|---|---|---|
| 1 | | Find all the eigen values for the matrix, A= $\begin{bmatrix}7 & -2 & 0\\ -2 & 6 & -2\\ 0 & -2 & 5\end{bmatrix}$ | 5 | CO6 | L3 |
| 2 | | Reduce the matrix, A $\begin{bmatrix}11 & -4 & 7\\ 7 & -2 & -5\\ 10 & -4 & -6\end{bmatrix}$ into a daiagonal matrix | 5 | CO6 | L3 |
| 3 | | Obtain the reduction formula for $\int \sin^n x dx$ | 5 | CO3 | L3 |
| 4 | | Diagonalize the matrix, A= $\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$ | 5 | CO6 | L3 |
| 5 | | Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}}dx$ | 5 | CO3 | L3 |
| 6 | | Show that the transformation $y_1=2x_1-2x_2-x_3$ , $y_2=-4x_1+5x_2+3x_3$ , $y_3=x_1-x_2-x_3$ is regular and find the inverse transformation | 5 | CO6 | L3 |
| 7 | | Apply Gauss-elimination method to solve the following equations: x-2y+3z=2; 3x-y+4z=4; 2x+y-2z=5 | 5 | CO6 | L3 |
| 8 | | Find the eigen values and eigen vector corresponding to the largest eigen value of the matrix A = $\begin{bmatrix}1 & 1 & 3\\ 1 & 5 & 1\\ 3 & 1 & 1\end{bmatrix}$ | 5 | CO6 | L3 |
| 9 | | If P= $\begin{bmatrix}-1 & 1 & 1\\ 0 & -1 & 2\\ 1 & 1 & 1\end{bmatrix}$ is a modal matrix of the matrix A = | 5 | CO6 | L3 |

| | | | | | |
|---|---|---|---|---|---|
| | | $\begin{bmatrix}1&1&3\\1&5&1\\3&1&1\end{bmatrix}$ and the inverse of P is $P^{-1}=\begin{bmatrix}-3&0&3\\2&-2&2\\1&2&1\end{bmatrix}$, then transform A into diagonal form and hence find $A^4$ | | | |
| 10 | | Derive then reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$. | 5 | CO3 | L3 |
| 11 | | Solve : $(x^2-4xy-2y^2)\,dx+(y^2-4xy-2x^2)\,dy=0$ | 5 | CO3 | L3 |
| 12 | | Solve : $(x+2y^3)\frac{dy}{dx}=¿y$ | 5 | CO3 | L3 |
| 13 | | Find the orthogonal trajectories of the family of the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2+\lambda}=1$ ('λ' being the parameter). | 5 | CO3 | L3 |
| 14 | | Solve : $(x^2+y^3+6x)dx+y^2xdy=0$. | 5 | CO3 | L3 |
| 15 | | Find the orthogonal trajectories of $r^n sinn\theta=a^n$, with a parameter and solve | 5 | CO3 | L3 |
| 16 | | Solve : $(y^3-3x^2y)dx-(x^3-3xy^2)\,dy=0$. | 5 | CO3 | L3 |
| 17 | | Find the orthogonal trajectories of the cardiods $r=a(1-\cos\theta)$, using the differential equation method | 5 | CO3 | L3 |
| 18 | | Solve : $(1-x^2)\frac{dy}{dx}-xy=1$ | 5 | CO3 | L3 |
| 19 | | Define orthogonal trajectories. Find the orthogonal trajectories of a system of co-axial circles $x^2+y^2+2\lambda y+c=2$, where λ is the parameter | 5 | CO3 | L3 |
| 20 | | Solve : $ydy+\sin^2(\frac{x}{y}¿(xdy-ydx)¿0$ | 5 | CO3 | L3 |
| 21 | | Solve: $\frac{dy}{dx}+xsin2y=x^3\cos^2 y$ | 5 | CO3 | L3 |
| 22 | | Test for consistency and solve the system of equations $x+4+3z=0$, $x-y+z=0$, $2x-y+3z=0$ | 5 | CO6 | L3 |
| 23 | | Applying Gauss Jordan method solve $2x+3y-z=5$, $4x+4y-3z=3$, $2x-3y+2z=2$ | 5 | CO6 | L3 |
| 24 | | Use elementary row transformations , find the rank of the matrix $\begin{bmatrix}0&1&-3&-1\\1&0&1&1\\3&1&0&2\\1&1&-2&0\end{bmatrix}$ | 5 | CO6 | L3 |
| 25 | | Solve using the Gauss Jordan method.<br>$X+y+z=9$; $x-2y+3z=8$; $2x+y-z=3$ | 5 | CO6 | L3 |
| 26 | | Apply Gauss-elimination method to solve the following equations:<br>$2x-y+3z=1$; $-3x+4y-5z=0$; $x+3y-6z=0$ | 5 | CO6 | L3 |
| 27 | | Applying Gauss Jordan method solve the system: $2x+5y+7z=52$; $2x+y-z=0$; $x+y+z=9$ | 5 | CO6 | L3 |
| 28 | | Solve the equations<br>(1). $x+2y+3z=0$; $3x+4y+4z=0$;$7x+10y+12z=0$<br>(2). $4x+2y+z+3w=0$; $6x+3y+4z+7w=0$;$2x+y+w=0$ | 5 | CO6 | L3 |

## D3. TEACHING PLAN – 3

### Module – 3

| Title: | Integral Calculus | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | - | **Blooms** |
| - | The student should be able to: | - | **Level** |
| 1 | Analyze the concept of change of order of integration using multiple integrals to compute area and volume | CO3 | L3 |
| | | | |
| **b** | ***Course Schedule*** | | |
| **Class No** | **Module Content Covered** | **CO** | **Level** |
| 1 | Review of elementary integral calculus. | CO3 | L3 |
| 2 | Evaluation of double integrals | CO3 | L3 |
| 3 | Problems on double integrals | CO3 | L3 |
| 4 | Evaluation of triple integrals | CO3 | L3 |
| 5 | Problems on triple integrals | CO3 | L3 |
| 6 | Change of order of integration | CO3 | L3 |
| 7 | Changing into polar coordinates. | CO3 | L3 |
| 8 | Problems on finding area and volume. | CO3 | L3 |
| 9 | Relation between beta and gamma functions and problems. | CO3 | L3 |
| 10 | Problems on beta gamma functions. | CO3 | L3 |
| | | | |
| **c** | **Application Areas** | - | **Level** |
| 1 | Multiple integrals are used to compute area and volume. | CO3 | L3 |
| | | | |
| **d** | **Review Questions** | - | - |
| 1 | Find the surface generated by revolving the cycloid x=a(θ-cosθ),y=a(1-cosθ) about its base, (consider one arc in the 1st quadrant ) | CO3 | L3 |
| 2 | Find the length of the arc of the cycloid x=a(t-sint), y=a(1-cost) | CO3 | L3 |
| 3 | Obtain the reduction formula for $\int \sin^n x dx$ | CO3 | L3 |
| 4 | Find the area of the surface formed by the revolution of $y^2$ =4ax about its axis , by the arc from the vertex to one end of the latus rectum | CO3 | L3 |
| 5 | Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}} dx$ | CO3 | L3 |
| 6 | Find the area of the loop of the curve$a^2$ $y^2$=$x^2$¿) | CO3 | L3 |
| 7 | Find surface area of the solid generated by revolution of $r^2 = a^2$ cos (2θ) about the line θ¿ $\frac{\pi}{2}$ | CO3 | L3 |
| 8 | Find the length of the arch of the cycloid x=a(t-sint), y=a(1-cost) | CO3 | L3 |
| 9 | Find the the volume of the solid generated by revolving the cycloid x=a(θ-sinθ),y=a(1-cosθ) about its base | CO3 | L3 |
| 10 | Derive then reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$. | CO3 | L3 |
| **e** | **Experiences** | - | - |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

## E3. CIA EXAM – 3

### a. Model Question Paper - 3

| Crs Code: | 18MAT11 | Sem: | I | Marks: | 50 | Time: | 90 minutes | | |
|---|---|---|---|---|---|---|---|---|---|
| Course: | Calculus and Linear Algebra | | | | | | | | |
| - | - | Note: Answer any 2 questions, each carry equal marks. | | | | | Marks | CO | Level |
| 1 | a | Find the angle between two curves r=cosθ and r=1-cosθ . | | | | | 6 | CO1 | L3 |
| | b | Find the radius of curvature of the following curve at the points indicted against them $\sqrt{x} + \sqrt{y} = \sqrt{a}$ , (x, y). | | | | | 6 | CO1 | L3 |
| | c | Find the angle between two curves r= $\frac{a}{1+cos\theta}$ and r= $\frac{b}{1-cos\theta}$ . | | | | | 6 | CO1 | L3 |
| | d | Find the equation of the evolute of the parabola $y^2=4ax$. | | | | | 7 | CO1 | L3 |
| | | **OR** | | | | | | | |
| 2 | a | Using Maclaurin's series expand tanx upto the term containing $x^5$. | | | | | 6 | CO2 | L3 |
| | b | Evauate : $\lim_{x \to \frac{\pi}{2}} sinx^{tanx}$ . | | | | | 6 | CO2 | L3 |
| | c | If u=f(x/y, y/z, z/x). Prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$. | | | | | 6 | CO3 | L3 |
| | d | Find the extreme values of $x^4+ y^4- 2(x-y)^2$. | | | | | 7 | CO3 | L3 |
| 3 | a | Evaluate: $\int_0^1 \int_x^{\sqrt{x}} x^2+y^2\, dydx$ | | | | | 6 | CO4 | L3 |
| | b | Evaluate: $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} dzdydx/\sqrt{1-x^2-y^2-z^2}$ | | | | | 6 | CO4 | L3 |
| | c | Evaluate: $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dydx$ , by changing to polar coordinates. | | | | | 6 | CO4 | L3 |
| | d | Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy\, dydx$ ,by changing the order of Integration. | | | | | 7 | CO4 | L3 |
| | | **OR** | | | | | | | |
| 4 | a | Find the rank of the matrix by reducing to echelon form: A= $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ | | | | | 6 | CO6 | L3 |
| | b | For what values of a and b , the system have (i)no solution (ii)unique solution (iii)Infinitely many solution<br>x +y+z =6<br>x+2y+3z =10<br>x+2y+az =b. | | | | | 6 | CO6 | L3 |
| | c | Solve the following system of equations by Gauss-Jordan method:<br>x +2y-z =-1<br>3x+8y+2z =28<br>4x+9y-z =14. | | | | | 6 | CO6 | L3 |
| | d | Diagonalize the matrix A=. $\begin{bmatrix} -1 & 2 \\ 2 & -1 \end{bmatrix}$ | | | | | 7 | CO6 | L3 |

### b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

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Model Assignment Questions

| Crs Code: | 18MAT11 | Sem: | I | Marks: | 10 | Time: | |
|---|---|---|---|---|---|---|---|
| Course: | Calculus and Linear Algebra. | | | | | | |

Note: Each student to answer 3 assignments. Each assignment carries equal mark.

| SNo | USN | Assignment Description | Marks | CO | Level |
|---|---|---|---|---|---|
| 1 | | Find the surface generated by revolving the cycloid x=a(θ-cosθ),y=a(1-cosθ) about its base, (consider one arc in the 1st quadrant ) | 5 | CO4 | L4 |
| 2 | | Find the length of the arc of the cycloid x=a(t-sint), y=a(1-cost) | 5 | CO4 | L4 |
| 3 | | Find the area of the surface formed by the revolution of $y^2$ =4ax about its axis , by the arc from the vertex to one end of the latus rectum | 5 | CO4 | L4 |
| 4 | | Find the area of the loop of the curve$a^2$ $y^2$=$x^2$¿) | 5 | CO4 | L4 |
| 5 | | Find surface area of the solid generated by revolution of $r^2 = a^2$ cos (2θ) about the line θ¿ $\frac{\pi}{2}$ | 5 | CO4 | L4 |
| 6 | | Find the length of the arch of the cycloid x=a(t-sint), y=a(1-cost) | 5 | CO4 | L4 |
| 7 | | Find the the volume of the solid generated by revolving the cycloid x=a(θ-sinθ),y=a(1-cosθ) about its base | 5 | CO4 | L4 |

## F. EXAM PREPARATION

### 1. University Model Question Paper

| Course: | Calculus and Linear Algebra | | | | | Month / Year | Feb /2018 |
|---|---|---|---|---|---|---|---|
| Crs Code: | 18MAT11 | Sem: | I | Marks: | 100 | Time: | 180 min |

| - | Note | Answer all FIVE full questions. All questions carry equal marks. | Marks | CO | Level |
|---|---|---|---|---|---|
| 1 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | **OR** | | | |
| 2 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | | | | |
| 3 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | **OR** | | | |
| 4 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | | | | |
| 5 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | **OR** | | | |
| 6 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | | | | |
| 7 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | **OR** | | | |

| | | | | | |
|---|---|---|---|---|---|
| 8 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | | | | |
| 9 | a | | 20 | | |
| | b | | | | |
| | c | | | | |
| | | **OR** | | | |
| 10 | a | | 20 | | |
| | b | | | | |
| | c | | | | |

## 2. SEE Important Questions

| Course: | Calculus and Linear Algebra | | | | | Month / Year | May /2018 | |
|---|---|---|---|---|---|---|---|---|
| Crs Code: | 18MAT11 | Sem: | 1 | Marks: | 100 | Time: | 180 minutes | |
| | **Note** | Answer all FIVE full questions. All questions carry equal marks. | | | | - | - | |
| Module | Qno. | Important Question | | | | **Marks** | **CO** | **Year** |
| 1 | 1 | Using the Maclaurin's series *prove that* $\sqrt{1+\sin 2x}$ =1+ x$\frac{-(x^2)}{(2)}+\frac{(x^3)}{6}+\frac{x^4}{24}$ -…… , | | | | 20 | CO1 | 2008 |
| | 2 | Expand f(x)=sin($e^x$-1) in powers of x up to the terms containing $x^4$ | | | | | CO1 | 2010 |
| | 3 | Find the pedal equation of the curve $r^m$=$a^m$(cosmθ+sinmθ). | | | | | CO1 | 2011 |
| | 4 | Find the angle of intersection of the curves r=alogθ ,r = $\frac{a}{log\theta}$ | | | | | CO1 | 2009 |
| | 5 | Find the radius of curvature at the point '$t$' on the curve x= a(t+sint) ,y= a(1-cost). | | | | | CO1 | 2008 |
| | | | | | | | | |
| 2 | 1 | Evaluate $\lim_{x\to 0}\left(\frac{a^x+b^x+c^x+d^x}{4}\right)^{\frac{1}{x}}$ | | | | 20 | CO2 | 2007 |
| | 2 | If x+ y+ z=u , y+ z=v,z=uvw show that $J\left(\frac{x,y,z}{u,v,w}\right)$=uv | | | | | CO3 | 2009 |
| | 3 | If u=$\frac{xy}{z}$ , v=$\frac{yz}{x}$ and w¿ $\frac{xz}{y}$ find $J\left(\frac{u,v,w}{x,y,z}\right)$ | | | | | CO3 | 2010 |
| | 4 | If u=xlog(xy) where $x^3+y^3+3xy=1$ , find $\frac{dy}{dx}$ and hence find $\frac{du}{dx}$ | | | | | CO2 | 2008 |
| | 5 | Evaluate: i) $\lim_{x\to\frac{\pi}{2}}(2x\tan x-\pi\sec x)$ | | | | | CO2 | 2011 |
| | | | | | | | | |
| 3 | 1 | Find the area of the surface formed by the revolution of $y^2$ =4ax about its axis , by the arc from the vertex to one end of the latus rectum | | | | 20 | CO4 | 2008 |
| | 2 | Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}}dx$ | | | | | CO4 | 2009 |
| | 3 | Find the surface generated by revolving the cycloid x=a(θ-cosθ),y=a(1-cosθ) about its base, (consider one arc in the 1st quadrant ) | | | | | CO4 | 2007 |
| | 4 | Find the the volume of the solid generated by revolving the cycloid x=a(θ-sinθ),y=a(1-cosθ) about its base | | | | | CO4 | 2010 |

| | | | | | |
|---|---|---|---|---|---|
| | 5 | Derive then reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$. | | CO4 | 2011 |
| | | | | | |
| 4 | 1 | Solve : ydy+sin²($\frac{x}{y}$ ¿(xdy-ydx) ¿ 0 | 20 | CO5 | 2008 |
| | 2 | Solve: $\frac{dy}{dx} + x\sin 2y = x^3 \cos^2 y$ | | CO5 | 2009 |
| | 3 | Find the orthogonal trajectories of $r^n \sin n\theta = a^n$, with a parameter and solve | | CO5 | 2010 |
| | 4 | Solve : ($y^3$-3$x^2$ y)dx-($x^3$-3x$y^2$) dy=0. | | CO5 | 2011 |
| | 5 | Find the orthogonal trajectories of the cardiods r=a(1-cos$\theta$), using the differential equation method | | CO5 | 2009 |
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| 5 | 1 | Applying Gauss Jordan method solve 2x+3y-z=5, 4x+4y-3z=3, 2x-3y+2z=2 | 20 | CO6 | 2009 |
| | 2 | Find all the eigen values for the matrix, A= $\begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$ | | CO6 | 2007 |
| | 3 | Show that the transformation $y_1$=2$x_1$-2$x_2$-$x_3$ , $y_2$=$-4x_1$+5$x_2$+3$x_3$ ,$y_3$= $x_1 - x_2 - x_3$ is regular and find the inverse transformation | | CO6 | 2007 |
| | 4 | Diagonalize the matrix, A= $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ | | CO6 | 2008 |
| | 5 | Apply Gauss-elimination method to solve the following equations: x-2y+3z=2; 3x-y+4z=4; 2x+y-2z=5 | | CO6 | 2009 |