AR20

CODE: 20BST101 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, June-2022

LINEAR ALGEBRA AND CALCULUS

(Common to All Branches)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Define rank of the matrix? Apply Echelon form to find the rank of the matrix $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 3 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ 5M

   b) Reduce the given matrix into Normal form and hence find the rank $\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}$ 5M

(OR)

2. a) Discuss for what values of λ, μ the simultaneous equations have a Unique solution. 5M

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

   b) Test for consistency and solve the following simultaneous equations 5M

   $x + 2y - z = 0,\ 2x + y + z = 0,\ x - 4y + 5z = 0.$

UNIT-II

3. Calculate the Eigen values of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ and the corresponding Eigen vectors. 10M

(OR)

4. Calculate Eigen values of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ and the corresponding eigen vectors. 10M

UNIT-III

5. a) Calculate the area enclosed by the Parabolas $y^2 = x$ and $x^2 = y$. 5M

b) Evaluate $\iint_R xy(x+y)\,dx\,dy$, over the region R bounded by $y = x^2$ and $y = x$ 5M

(OR)

6. Find the integral $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} dy\,dx$ by changing the order of integration 10M

UNIT-IV

7. Show that $\int_0^{\pi/2} \sin^m\theta \cos^n\theta d\theta = (1/2)B(\frac{m+1}{2}, \frac{n+1}{2})$ 10M

(OR)

8. a) Show that $\int_{-1}^{1} (1+x)^{m-1}(1-x)^{n-1} = 2^{m+n-1}B(m,n)$ 5M

b) Show that $\Gamma(1/2) = \sqrt{\pi}$ 5M

UNIT-V

9. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point (2,-1,2) 10M

(OR)

10. Show that the vector field $\bar{A} = 2xyz^2\,\bar{i} + (x^2z^2 + z\cos yz)\,\bar{j} + (2x^2yz + y\cos yz)\,\bar{k}$ is irrotational. Find the scalar potential function. 10M

UNIT-VI

11. Verify Green's theorem in plane for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where C is the region bonded by $y = \sqrt{x}$ and $y = x^2$. 10M

(OR)

12. Verify Gauss Divergence theorem for $\bar{F} = x^2\,\bar{i} + y^2\,\bar{j} + z^2\bar{k}$ over the cube formed by the planes x = 0 , x = a , y = 0 y = b, z =0,z=c 10M

AR18

CODE: 18BST101 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, June-2022

LINEAR ALGEBRA AND CALCULUS

(Common to CE, EEE, ME. ECE, CSE, IT Branches)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Discuss for what values of λ, μ, the simultaneous equations 6M

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

b) Solve the equations $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$, Using Gauss elimination method 6M

(OR)

2. Find the eigen values and eigen vectors of the matrix 12M

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

UNIT-II

3. a) If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$ then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$ 6M

b) If $x = u(1+v), y = v(1+u)$ then prove that $\frac{\partial(x,y)}{\partial(u,v)} = 1 + u + v$ 6M

(OR)

4. A rectangular box open at the top is to have volume of 32 cubic ft. Find the dimensions of the box requiring least material for its construction 12 M

UNIT-III

5. Calculate the surface area of the sphere generated by the circle $x^2 + y^2 = 16$ about its diameter. 12M

(OR)

6. Find the volume of the solid generated by the revolution of the cardioid $r = a(1+\cos\theta)$ about the initial line $\theta = 0$. 12M

UNIT-IV

7. Evaluate $\int_0^1 \int_{x^2}^{2-x} xydydx$ by changing the order of integration 12 M

(OR)

8. Evaluate the double integral $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dxdy$ 12M

UNIT-V

9. a) Find the unit normal vector to the given surface $x^2 y + 2zx = 4$ at (2,-2,3) 6M

b) Find the curl $\bar{f}$ where $\bar{f} = grad(x^3 + y^3 + z^3 - 3xyz)$ 6M

(OR)

10. Verify Green's theorem in a plane for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where C is the region bounded by $y = \sqrt{x}$ and $y = x^2$ 12M

AR16

CODE: 16BS1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.TECH I SEM SUPPLEMENTARY EXAMINATIONS, JUNE,2022

ENGINEERING MATHEMATICS – I

(Common to CE, EEE, ME. ECE, CSE & IT Branches)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Solve $y(x^2y^2-1)dx+x(x^2y^2+1)dy=0$. 7M
   b) Show that the family of parabolas $y^2=4cx+4c^2$is "self-orthogonal". 7M

(OR)

2. a) Solve $2(y-4x^2)dx+xdy=0$. 7M
   b) A body is heated to 110^{O}C and placed in air at10^{O}C. After 1 hour its temperature is 60^{O}. How much additional time is required for it to cool to 30^{O}C ? 7M

UNIT-II

3. Solve$(D^2+4D+4)y=2e^{4x}+Cos\,2x$. 14M

(OR)

4. Solve $(D^2+1)y=\log Cosx$ by the method of variation of parameters. 14M

UNIT-III

5. If $x=\sqrt{wv}, y=\sqrt{uw}, z=\sqrt{uv}$and $u=r\,Sin\,\theta.Cos\phi, v=r\,Sin\,\theta\,Sin\,\phi$, $w=rCos\,\theta$, Calculate $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}$ 14M

(OR)

6. Find the maximum and minimum values of $f(x,y)=x^3+3xy^2-15x^2-15y^2+72x$. 14M

UNIT-IV

7. Evaluate $\iiint x^2yz\,dx\,dy\,dz$ taken over the volume bounded by the surface $x^2+y^2=9, z=0, z=2$. 14M

(OR)

8. Change the order of integration and evaluate $\int_0^a\int_{\frac{y^2}{a}}^{2a-y}xy\,dxdy$. 14M

UNIT-V

9. a) Determine the directional derivative of $f=xy+yz+zx$ in the directionof the vectori + 2j + 2kat the point (1, 2, 0) 7M
   b) Prove that $\bar{A}=(6xy+z^3)i+(3x^2-z)j+(3xz^2-y)k$ is irrotational. Find a scalar function $f(x,y,z)$ such that$\bar{A}=\nabla f$. 7M

(OR)

10. Verify Stokes' theorem for$\bar{A}=xzi-yj+x^2yk$ where *S* is the surface of the regionbounded by *x* = 0, *y* = 0, *z* = 0, 2*x* + *y* + 2*z* = 8which is not included in the *xz*-plane 14M

AR13

CODE: 13BS1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.TECH I SEM SUPPLEMENTARY EXAMINATIONS, JUNE,2022

ENGINEERING MATHEMATICS - I
(Common to All Branches)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) Find the orthogonal trajectories of the family $y^2 = 4ax$.
   b) Find the integrating factor of the linear differential equation $\frac{dy}{dx} + \frac{y}{x} = \frac{logx}{x}$.
   c) Solve $(D^2 - 1)\, y = 0$.
   d) If $f(D) = D^2 + 4$, then find $\frac{1}{f(D)}\ cos3x$.
   e) If $U = x^2+y^2$, $x=t^2$ and $y =2t$,find du/dt.
   f) Find the stationary points of $f(x, y) = x^2 + y^2 - 6x+12$.
   g) Evaluate $\int_0^2 \int_0^3 xydxdy$
   h) Transform to Cartesian form $\int_0^{\pi/2} \int_0^a r^3 \sin\theta \cos\theta d\theta dr$.
   i) If $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$, then find curl $\bar{r}$
   j) State Stoke's theorem.

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) Form the differential equation of the family of circles having centre on x-axis and passing through the origin. [6M]
   b) Solve $\frac{dy}{dx} + y = x^3y^6$. [6M]

(OR)

3. a) Solve $(1 - x^2)\frac{dy}{dx} + 2xy = x\sqrt{1 - x^2}$. [6M]
   b) Solve $x^2y\, dx - (x^3+y^3)dy = 0$ [6M]

UNIT-II

4. Solve $(D^2+1)y = e^{-x} + x^2 + e^x \sin x$. [12M]

(OR)

5. Solve $(D^3-3D^2+3D-1)y = x\, e^x$ [12M]

UNIT-III

6. a) Find the Taylor series of $f(x, y) = e^{xy}$ in powers of x-1 and y-1 [6M]
   b) If $x+ y + z = u$, $y + z = uv$ and $z = uvw$ find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$. [6M]

(OR)

7. Find the maximum and minimum values of $f(x,y) = x^3-3xy^2-15x^2-15y^2+72x$ [12M]

AR13

CODE: 13BS1001 SET-2

UNIT-IV

8. Change the order of integration and evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$ [12M]

(OR)

9. Find the volume common to the cylinders $x^2+y^2=a^2$ and $x^2+z^2 = a^2$. [12M]

UNIT-V

10. a) Find div $\bar{f}$ where $\bar{f} = (x^2-yz)\,\bar{\imath} +(y^2-xz)\,\bar{\jmath} +(z^2-xy)\bar{k}$ at (1,2,1) [6M]
    b) Find a unit normal to the surface $x^2+y^2+2z^2 =26$ at (2,2,6) [6M]

(OR)

11. Evaluate $\int \bar{F}.\bar{n}dS$ where $\bar{F} = z\bar{\imath} + x\bar{\jmath} -3y^2z\,\bar{k}$ and Sis the surface $x^2+y^2=16$ included in the first octant between z = 0 and z =5. [12M]

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