AR18

CODE: 18BST101 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Regular & Supplementary Examinations, December, 2019

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) Determine the rank of the matrix 6M

$$A = \begin{bmatrix} 1 & 0 & 2 & 1 \\ 5 & 3 & -2 & 2 \\ 0 & -2 & 4 & 7 \end{bmatrix}$$

b) Solve the system of equations x + y + z = 6, 2y + 5z = - 4, 2x + 5y - z = 27 by Echelon method 6M

(OR)

2. a) Obtain the Eigen values and Eigen vectors of the matrix 6M

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

b) Determine the characteristic equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ and hence find its inverse 6M

UNIT-II

3. a) If x increases at the rate of $2cm/sec$ at the instant when $x = 3cm$ and $y = 1cm$ what rate must y be changing in order that the function $2xy - 3x^2y$ shall be neither increasing nor decreasing. 6M

b) A rectangular box open at the top is to have volume of 32 cubic feet. Determine the dimensions of the box requiring least material for its construction 6M

(OR)

4. a) Apply Taylor's series to expand $f(x,y)=x^2+ xy + y^2$ in powers of (x-1)and (y-2) 6M

b) Determine the extreme values of the following function 6M

$$f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$$

UNIT-III

5. a) Obtain the area included between the curve $y^2(2a-x) = x^3$ and its asymptote. 6M

b) Evaluate $\int_0^{\pi} sin^2\theta \, cos^4\theta d\theta$ 6M

(OR)

6. a) Find the surface of the solid formed by revolving the cardioid $r = a(1+\cos\theta)$ about the initial line. 6M

b) Find the volume formed by the revolution of loop of the curve $y^2(a+x) = x^2(3a-x)$ about the x-axis. 6M

UNIT-IV

7. a) Evaluate $\iint_A xydxdy$ where A is the domain bounded by x-axis, ordinate $x = 2a$ and the curve $x^2 = 4ay$. 6M

b) Change the order of integration and hence evaluate $I = \int_0^a \int_{\sqrt{ax}}^a \frac{y^2 dxdy}{\sqrt{(y^4 - a^2x^2)}}$ 6M

(OR)

8. a) Evaluate $\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} (x+y+z) dydzdx$ 6M

b) Find the volume bounded by the paraboloid $x^2 + y^2 = az$, the cylinder $x^2 + y^2 = 2ay$ and the plane $z = 0$ 6M

UNIT-V

9. a) Find the directional derivative of $\phi = 5x^2y - 5y^2z + 2.5z^2x$ at the point P(1,1,1) in the direction of the line $\frac{x-1}{2} = \frac{y-3}{-2} = z$. 6M

b) If C is simple closed curve in the xy-plane not enclosing the origin, find the integral value $\int_C F.dR$, where F=$\frac{yi - xj}{x^2 + y^2}$. Apply Stokes theorem 6M

(OR)

10. a) If $F = 3xyI - y^2J$, evaluate $\int F.\mathrm{dR}$, where C is the curve in the $xy-$ plane $y = 2x^2$ from (0, 0) to (1, 2). 6M

b) If $F = 3yI - xzJ + yz^2K$ and S is the surface of the paraboloid $2z = x^2 + y^2$ bounded by $z = 2$, evaluate $\iint (\nabla \times F).dS$ using stokes theorem. 6M

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AR16

CODE: 16BS1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.TECH I SEM SUPPLEMENTARY EXAMINATIONS, DECEMBER, 2019

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 $(2x\log x - xy)dy + 2ydx = 0$. 7M
   b) Find the orthogonal trajectories of the family of curves $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, where a is the parameter. 7M

(OR)

2. a) Solve $\frac{dy}{dx} + 2xy = e^{-x^2}$ 7M
   b) A body is originalyy at 80^0C and cools down to 60^0C in 20 minutes . If the temperature of of the air is 40^0C. Find the temperature of the body after 40 minutes? 7M

UNIT-II

3. a) Solve Solve $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = e^{2x}$ 7M
   b) Solve $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 4y = x^4$. 7M

(OR)

4. a) Solve $(D+2)^2 y = x^2$. 7M
   b) Solve $(D^2 + 4)y = Tan2x$ using variation of parameters method. 7M

UNIT-III

5. a) Expand e^x using Maclaurin's series 7M

b) If $u = 3x + 2y - z, v = x - 2y + z, w = x + 2y - z$ show that they are functionally related and find the relation between them. 7M

(OR)

6. Discuss the maxima and minima of $x^2+y^2+6x+12$ 14M

UNIT-IV

7. a) Evaluate $\int_{y=0}^{2}\int_{x=0}^{3} xy\,dx\,dy$ 7M

b) By changing the order of integration to Evaluate $\int_0^1\int_0^{\sqrt{1-x^2}} y^2\,dy\,dx$ 7M

(OR)

8. a) Evaluate $\iint (x+y)\,dx\,dy$, over the region in the positive quadrant bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. 7M

b) Evaluate $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} xyz\,dz\,dy\,dx.$ 7M

UNIT-V

9. a) Find constants *a, b, c* so that the vector $\overline{A}=(x+2y+az)\overline{i}+(bx-3y-z)\overline{j}+(4x+cy+2z)\overline{k}$ is irrotational. Also find ϕ such that $\overline{A}=\nabla\phi$. 7M

b) Find the work done in moving a particle in the force field $\overline{F}=3x^2\overline{i}+(2xz-y)\overline{j}+z\overline{k}$ along the straight line from (0,0,0) to (2,1,3). 7M

(OR)

10. Verify Green's theorem for $\int_c\left[(3x^2-8y^2)dx+(4y-6xy)dy\right]$ where c is the region bounded by $y=\sqrt{x}$ and $y=x^2$. 14M

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AR13

CODE: 13BS1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech I Semester Supplementary Examinations, December-2019
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) Convert the DE $x^4 \frac{dy}{dx} + x^3 y + Co\sec(xy) = 0$ to Bernouli DE.
   b) What is the role of Integrating Factor (IF) in a differential equation?
   c) Find the complementary function (CF) of $\frac{d^2x}{dt^2} - 4x = 0$
   d) Find the Particular Integral (PI) of $(D-1)y = e^{2x}$
   e) Write expansion of e^x
   f) If $If\ u^2 = x^2 + y^2\ \ find \frac{\partial u}{\partial x}$
   g) Write the formula for the volume revolution of curve y=y(x) about y-axis from y_1 to y_2.
   h) Find the value of $\int_{-a}^{a} f(x)dx\ when\ f(x)\ is\ odd\ function?$
   i) Find $\nabla \times \mathbf{R}$ if $\bar{R} = xi + yj + zk$
   j) State Stokes Theorem .

PART-B

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

UNIT-I

2.	a	Solve : $y' - \cot y + x \cot y = 0$	6M
	b	Solve : $(x^4 + y^4)dx - xy^3 dy = 0$	6M
		(OR)	
3.	a	Solve the 1st order DE $\left(y^2 e^{xy^2} + 4x^3\right)dx + \left(2xy e^{xy^2} - 3y^2\right)dy = 0$	6M
	b	A Radioactive substance disintegrates at a rate proportional to its mass. When its mass is 10 mg. the rate of disintegration is 0.051 mg per day. How long will it take for the mass to be reduced from 10mgm to 5 mg.	6M

UNIT-II

4.	a	Solve the second order DE $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 4y = e^x\ Sin\frac{x}{2}$	6M
	b	Sove the ODE by variation of parameters method: $\left(D^2 + 1\right)y = Co\sec x$	6M

(OR)

5. a Solve: $\frac{d^2y}{dx^2}+4y=x\,Sin\,x$ **6M**

b Solve the higher order DE $\left(D^4-1\right)y=e^x\,Cosx$ **6M**

UNIT-III

6. a Show that $\log(1+x)=x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+.....by\,Maclaurin's\ series.$ **6M**

b Find the minimum value of $f(x,y)=xy+\frac{a^3}{x}+\frac{a^3}{y}$ **6M**

(OR)

7 a If $x=r\,Sin\theta\,Cos\phi,\ y=rSin\theta\,Sin\phi, z=r\,Cos\theta$, show that $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}=r^2Sin\theta$ **6M**

b Prove that the rectangular solid of maximum volume which can be inscribed in a sphere is a cube. **6M**

UNIT-IV

8. a Find the perimeter of the curve r=a cos θ **6M**

b Evaluate by Changing to polar coordinates $\int_0^\infty\int_0^\infty e^{-\left(x^2+y^2\right)}dx\,dy$ **6M**

(OR)

9. a Find the total surface of a sphere of radius ‘a’.

b Evaluate the triple integral $\int_0^1\int_{y^2}^1\int_0^{1-x}x\,dz\ dy\ dx$ **6M**

UNIT-V

10. a If $\bar{F}$ is a Solenoidal vector, show that curl $\nabla\times\nabla\times\nabla\times\nabla\times\bar{F}=\nabla^4\bar{F}$ **6M**

b If $f=(x^2+y^2+z^2)$, find gradient of (f) **6M**

(OR)

11. Verify divergence theorem $\int_S\bar{F}\cdot\bar{N}\,ds=\int_E div\,\bar{F}\,dv$ for $\bar{F}=x^2i+z\,j+y\,z\,k$ taken over the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z = 1 **12M**

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