AR18

CODE: 18BST101 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, February-2020

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) Reduce the matrix A= $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ to Echelon form and find its rank — 4M

   b) Solve the equations 5x+3y+7z=4, 3x+26y+2z=9, 7x+2y+10z=5. — 8M

(OR)

2. Find the Eigen values and Eigen vectors of the matrix A= $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$ — 12M

UNIT-II

3. a) Verify Rolle's theorem for f(x)= $(x-a)^m(x-b)^n$ in $[a,b]$ where m, n are positive integers. — 6M

   b) If f(x) and g(x) are respectively e^x and e^{-x}, prove that c of Cauchy's mean value theorem is the arithmetic mean of a and b. — 6M.

(OR)

4. a) Expand $\log_e x$ in powers of (x-1) and hence evaluate $\log_e 1.1$ correct to four decimal places. — 6M

   b) Examine f(x ,y)= $x^4+y^4-2x^2+4xy-2y^2$ for extreme values. — 6M

UNIT-III

5. a) Find the perimeter of the loop of the curve $9ay^2 = (x - 2a)(x - 5a)^2$. 6M

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

(OR)

6. a) Find the perimeter of the cardioid $r = a(1 + \cos\theta)$. 6M

   b) Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ about the minor axis. 6M

UNIT-IV

7. Change the order of integration in $I=\int_0^1\int_{x^2}^{2-x} xy\,dx\,dy$ and hence evaluate the same. 12M

(OR)

8. a) Evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dxdy$ by changing into polar coordinates. Hence show that $\int_0^\infty e^{-x^2}dx=\frac{\sqrt{\pi}}{2}$. 6M

   b) Evaluate $\iiint_R (x+y+z)dzdydx$ where R is the region bounded by the planes x = 0, x = 1, y=0, y=1, z = 0, z = 1. 6M

UNIT-V

9. Verify Green's theorem for $\int_c\left[(3x^2-8y^2)dx+(4y-6xy)dy\right]$ where c is the boundary of the region bounded by x=0, y=0, x+y=3. 12M

(OR)

10. a) Find the directional derivative of $f=xy^2+yz^3$ at the point (2,-1,1) in the direction of the normal to the surface $x\log z-y^2=-4$ at (-1,2,1). 6M

    b) Prove that $\frac{\bar{r}}{r^3}$ is solenoidal. 6M

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CODE: 16BS1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech I Semester Supplementary Examinations, February-2020

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 $(1+y^2)dx = (\tan^{-1} y - x)dy$	7M
	b	Prove that the system of parabolas $y^2 = 4a(x+a)$ is self-orthogonal.	7M

(OR)

2.	a	Solve $(y\log x - 1)\,y\,dx = x\,dy$	7M
	b	A body is originally at $80^0 C$ and cools down to $60^0 C$ in 20 minutes. If the temperature of the air is $40^0 C$, find the temperature of the body after 40 minutes.	7M

UNIT-II

3.	a	Solve $(D^2+1)y = \sin x \sin 2x$	7M
	b	Solve $(D^2+D)y = x^2+2x+4$	7M

(OR)

4.	a	Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$	7M
	b	Solve $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$ by the method of variation of parameters.	7M

UNIT-III

5.	a	If $x = r\cos\theta$; $y = r\sin\theta$ then show that $\frac{\partial^2 r}{\partial x^2} + \frac{\partial^2 r}{\partial y^2} = \frac{1}{r}\left[\left(\frac{\partial r}{\partial x}\right)^2 + \left(\frac{\partial r}{\partial y}\right)^2\right]$	7M
	b	Obtain Taylor's expansion for $\tan^{-1}(y/x)$ about (1,1) upto second degree terms	7M

(OR)

6.	a	Find the shortest distance from origin to the surface $xyz^2 = 2$	7M
	b	Verify if $u = 2x - y + 3z$, $v = 2x-y-z$, $w = 2x-y+z$ are functionally dependent and if so, find the relation between them.	7M

UNIT-IV

7.	a	By change the order of integration , evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} dydx$	7M
	b	Evaluate $\iint (x^2+y^2)dxdy$ in the positive quadrant for which $x+y \le 1$	7M

(OR)

8.	a	Evaluate $\iint_R (x^2+y^2)dxdy$, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$	7M
	b	Changing into polar coordinates and evaluate $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)}dydx$	7M

UNIT-V

9.	a	Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point P(1,2,3) in the direction of the line PQ where Q is (5,0,4)	7M
	b	Find the Scalar potential ϕ such that $\overline{F} = \nabla\phi$ where $\overline{F} = 2xyz^3\overline{i} + x^2z^3\overline{j} + 3x^2yz^2\overline{k}$	7M

(OR)

10.	a	Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region defined by $y = \sqrt{x}$ and $y = x^2$.	14M

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AR 13 **SET 01**

Code : 13BS1001

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, February-2020

ENGINEERING MATHEMATICS – I

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

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

PART-A

Answer all questions **[10 X 1 = 10 M]**

1. a) Find the Integrating Factor of the linear differential equation $x^2\frac{dy}{dx}+\frac{y}{x}=2x^2$.

   b) Check the differential equation $(5x^4+3x^2y^2-2xy^3)dx+(2x^3y-3x^2y^2-5y^4)dy=0$ for exactness.

   c) Solve $(D^2 + 9)y = 0$

   d) Find the particular integral $[y_p]$ of the differential equation $(D^2 - 4)y = e^{2x}$

   e) If $u=\log\frac{x^2}{y}$, then find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$.

   f) If $x = u(1-v)$, $y = uv$ then Find $\frac{\partial(x,y)}{\partial(u,v)}$

   g) Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$

   h) Write the formula for finding Moment of Inertia of a solid about x-axis.

   i) If $\Phi = 3x^2y - y^3z^2$, then find grad Φ at (1,-2,-1)

   j) Find curl(xy i + yz j + zx k)

PART-B

Answer one question from each unit **[5 X 12 = 60 M]**

UNIT - I

2. a) Solve $x^2\frac{dy}{dx}=3x^2-2xy+1$

   b) Find the orthogonal trajectories of the family of circle $x^2 + y^2 + 2fy + 1 = 0$.

   [6M + 6M]

(OR)

3. a) Solve $\frac{dy}{dx}+2xy=e^{-x^2}$

   b) Solve $\frac{dy}{dx}+y\cos x= y^3 Sin(2x)$ **[6M + 6M]**

UNIT - II

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

(OR)

5. Solve $\frac{d^3y}{dx^3} + 4\frac{dy}{dx} = Sin2x$ **[12M]**

UNIT – III

6. a) Find Taylors series expansion of Sin(2x) about $x = \pi/4$

   b) If $u = \frac{x+y}{x-y}$ $and\ \theta = tan^{-1}x + tan^{-1}y, find\ \frac{\partial(u,\theta)}{\partial(x,y)}$ **[6M + 6M]**

[6M + 6M]

(OR)

7. Find the volume of the greatest rectangular parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ **[12M]**

UNIT - IV

8. a) Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dzdydx$

   b) Find the surface area of the solid generated by revolving the arc of the parabola $x^2 = 12y$, bounded by its latus rectum about y-axis. **[6M + 6M]**

(OR)

9. Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} xydxdy$ and hence Evaluate the double integral. **[12M]**

UNIT - V

10. a) Find the angle of intersection of the spheres $x^2 + y^2 + z^2 = 39$ and $x^2 + y^2 + z^2 + 4x - 6y - 8z + 52 = 0$ at (4,-3,2).

    b) Prove that $\nabla^2(r^n) = n(n+1)r^{n-2}$ where $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ and $r = |\bar{r}|$. **[6M + 6M]**

(OR)

11. By Transforming into triple integral to evaluate $\int\int x^3dydz + x^2ydydx + x^2zdxdy$, where the surface is the closed surface consisting the cylinder $x^2 + y^2 = a^2$ and the circular disc z=0 and z=6. **[12M]**