AR18

CODE: 18BST101 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, April-2021

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 Test for consistency and solve $2x-3y+7z=5, 3x+y-3z, 2x+19y-47z=32.$ 12M

(OR)

2. Find Eigen values and corresponding Eigen vectors for the matrix 12M

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 6 \end{bmatrix}$$

UNIT-II

3. Prove that $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$, if $0 < a < b < 1.$ 12M

(OR)

4 Determine the maximum and minimum distances of the point $(3,4,12)$ from the sphere $x^2 + y^2 + z^2 = 4.$ 12M

UNIT-III

5. a) Prove that the area of a loop of the curve $x^3 + y^3 = 3axy$ is $\frac{3a^2}{2}$ 6M

b) Find the perimeter of the loop of the curve $3ay^2 = x(\mathrm{x}-\mathrm{a})^2$ 6M

(OR)

6. Evaluate $\int_0^1 \frac{\sin^{-1} x}{x} dx.$ 12M

UNIT-IV

7. Evaluate $\int_0^1 \int_{e^x}^{e} \frac{dydx}{\log y}$ by changing the order of integration. 12M

(OR)

8. Evaluate $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z dz dy dx$ 12M

UNIT-V

9 Show that $div\left(grad\ r^n\right) = n(n+1)r^{n-2}$ 12M

(OR)

10. Verify Greens theorem for $\int_C \left[\left(3x-8y^2\right)dx + \left(4y-6xy\right)dy\right]$ where C is the boundary of the region bounded by $x=0, y=0$ and $x+y=1$ 12M

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AR16

CODE: 16BS1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, April-2021

ENGINEERING MATHEMATICS – I

(Common to All Branches)

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

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

1. a) Solve $(x^3y^2+x)\,dy+(x^2y^3-y)dx = 0$ 7M

   b) Find the orthogonal trajectories of family of curves $ay^2 = x^3$. 7M

(OR)

2. a) Solve $2ydx+x(2\log x-y)dy=0$ 7M

   b) If the air is maintained at 30^0C and the temperature of the body cools from 80^0C to 60^0C in 12 minutes, find the temperature of the body after 24 minutes 7M

UNIT-II

3. Solve $(D-2)^2y=8(e^{2x}+\sin 2x+x^2)$ 14M

(OR)

4. Solve $(D^4+2D^2+1)\,y = x^2\cos x$ 14M

UNIT-III

5. a) If $F = xu+v-y$, $G = u^2+vy+w$, $H = zu-v+vw$, compute $\dfrac{\partial(F,G,H)}{\partial(u,v,w)}$ 7M

   b) Expand $f(x,y) = xy^2+\cos(xy)$ about the point $(1,\dfrac{\pi}{2})$ upto 3^{rd} degree terms. 7M

(OR)

6 Examine the following function for extreme values. 14M

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

UNIT-IV

7 Evaluate the integral $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x\,dy\,dx}{\sqrt{x^2+y^2}}$ by changing of order of integration . 14M

(OR)

8 Evaluate the integral $\int_0^{\log 2} \int_0^x \int_0^{x+\log y} e^{x+y+z}\,dx\,dy\,dz$. 14M

UNIT-V

9 a) Find the total work done in moving a particle in a force field given by 7M

$\vec{F} = 3xy\vec{i} - 5z\vec{j} + 10x\vec{k}$ along the curve $x = t^2+1, y = 2t^2, z = t^3$ from $t = 1$ to $t = 2$

b) Find the angle between the surfaces 7M

$x^2+y^2+z^2 = 9$ and $z = x^2+y^2-3$ at the point (2 , -1 , 2).

(OR)

10. Verify Stoke's theorem for the vector field 14M

$\vec{F} = (2x-y)\vec{i} - yz^2\vec{j} - y^2z\vec{k}$ over the upper half surface of $x^2+y^2+z^2 = 1$, bounded by its projection on the xy – plane .

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AR13

CODE: 13BS1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech I Semester Supplementary Examinations, April-2021

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) Is $(y^2 - 2xy)dx = (x^2 - 2xy)dy$ exact? **1M**
   b) Solve xdy+ydx=0 **1M**
   c) Solve $y' + y = e^{e^x}$. **1M**
   d) If $f(D) = (D^2 + 4D + 4)$, then find $\frac{1}{f(D)}\sin 2x$. **1M**
   e) If $x = r\cos\theta$, $y = r\sin\theta$ then find $\frac{\partial(x,y)}{\partial(r,\theta)}$. **1M**
   f) What is a Stationary value of a two variable function? **1M**
   g) Solve $\int_{\theta=0}^{\pi}\int_{0}^{\theta} r\, dr d\theta$. **1M**
   h) Evaluate $\int_0^2\int_0^x e^{x+y}\, dydx$. **1M**
   i) Show that $grad\, \bar{r} = \bar{r}/|\bar{r}|$. **1M**
   j) Prove that $\nabla f \times \nabla g$ is solenoidal. **1M**

PART-B

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

UNIT-I

2. a) A body kept in air with temperature 25^0 C cools from 140^0C to 80^0 C in 20 minutes. Find when the body cools down to 35^0 C. **6M**
   b) Solve $\frac{dy}{dx} + y\tan x = y^2 \sec x$ **6M**

(OR)

3. a) Solve $xdx + ydy = \frac{xdy - ydx}{x^2+y^2}$. **6M**
   b) The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially100 and increased to 332 in one hour. What was the value of N after $1\frac{1}{2}$ hours. **6M**

UNIT-II

4. Solve $\frac{d^2y}{dx^2} + \frac{3dy}{dx} + 2y = x\, e^x \sin x$ **12M**

(OR)

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5. Solve $(D^3 - 7D^2 + 14D - 8)y = e^x cos2x$ **12M**

UNIT-III

6. a) Expand $\tan^{-1}x$ about the origin using Taylor's theorem. **6M**
   b) If $u = x^2 - y^2, v = 2xy$ where $x = rcos\theta$, $y = rsin\theta$, show that $\frac{\partial(u,v)}{\partial(r,\theta)} = 4r^3$ **6M**

(OR)

7. Examine the function for extreme values **12M**
$f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$ $(x > 0, y > 0)$.

UNIT-IV

8. By change of order of integration evaluate $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} xy^2 \, dy \, dx$ **12M**

(OR)

9. a) Evaluate $\int\int r \, drd\theta$ over the cardioids $r = a(1 - cos\theta)$ about the initial line. **6M**
   b) Find the area enclosed by curves $y^2 = ax$ and $x^2 = ay$. **6M**

UNIT-V

10. a) If $\bar{f} = xy^2\bar{i} + 2x^2yz\bar{j} - 3yz^2\bar{k}$, find div $\bar{f}$ at the point (1, -1, 1). **6M**
    b) Prove that $\nabla^2(r^n) = n(n+1)r^{n-2}$ **6M**

(OR)

11. Verify Stoke's theorem for $\bar{F} = (y - z + 2)i + (yz + 4)j - xzk$ where S is the surface of the cube x= y = z = 0, x = y = z = 2 above the xy-plane. **12M**

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