# AR18

**CODE: 18BST101** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**

**(AUTONOMOUS)**

**I B. Tech I Semester Supplementary Examinations, January-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) Find the value of $k$ it the Rank of Matrix $A$ is 2, where $A=\begin{bmatrix}0 & 1 & -3 & -1\\ 1 & 0 & 1 & 1\\ 3 & 1 & 0 & 2\\ 1 & 1 & K & 0\end{bmatrix}$. 6M

b) Solve completely the system of equations: $x+3y-2z=0$; $2x-y+4z=0$; $x-11y+14z=0$.

**(OR)**

2. a) Diagonal the matrix $A=\begin{bmatrix}3 & -1 & 1\\ -1 & 5 & -1\\ 1 & -1 & 3\end{bmatrix}$ and find $A^4$ using modal matrix ? 12M

## UNIT-II

3. a) Discuss the applicability of Rolle's theorem for $f(x)=\ln\left(\frac{x^2+ab}{x(a+b)}\right)$ in $[a,b]$, where $a>0, b>0$. 6M

b) Find $\frac{du}{dt}$, if $u=xy+yz+zx$ where $x=\frac{1}{t}$, $y=e^t$, $z=e^{-t}$. 6M

**(OR)**

4. a) Expand $f(x,y)=e^y\ln(1+x)$ in powers of $x$ and $y$ using Maclaurin's series. 6M

b) Find the minimum value of $x^2+y^2+z^2$ given $x+y+z=3a$. 6M

## UNIT-III

5. a) Find the length of the arc $y - \ln\left(\frac{e^x-1}{e^x+1}\right)$ from $x = 1, x = 2$. 6M

   b) Find the surface area generated by the revolution of an arc of the catnary $y = c\cosh\frac{x}{c}$ about $x - axis$. 6M

**(OR)**

6. a) Find the surface area of the solid generated by the revolution of the parabola $y^2 = 4ax$ about its axis, by the arc from the vertex to one end of the latus-rectun. 6M

   b) Find the volume of the solid generated by revolving the lemniscates $r^2 = a^2\cos 2\theta$ about the line $\theta = \frac{\pi}{2}$. 6M

## UNIT-IV

7. a) Evaluate $\int_0^2\int_0^{x^2} x(x^2+y^2)\,dx\,dy$. 6M

   b) Evaluate $\int_0^{\frac{\pi}{2}}\int_0^{a\sin\theta}\int_0^{\frac{a^2-r^2}{a}} r\,dz\,dr\,d\theta$ 6M

**(OR)**

8. a) Change the order of integration and evaluate $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dx\,dy$ 6M

   b) Evaluate $\int_0^1\int_0^{1-z}\int_0^{1-y-z} xyz\,dz\,dy\,dx$. 6M

## UNIT-V

9. Verify Stoke's theorem for $\bar{F} = (2x-y)\,\bar{i} - yz^2\,\bar{j} - y^2z\,\bar{k}$ over the upper half surface of the sphere $x^2+y^2+z^2 = 1$ bounded by the projection of the $xy - plane$ 12M

**(OR)**

10. a) Find the directional derivative of $f(x,y,z) = xy^2 + yz^3$ at the point $(2,-1,1)$ in the direction of the vector $i + 2j + 3k$. 6M

    b) If $\bar{F} = (5xy - 6x^2)\,\bar{i} + (2y-4x)\,j$, evaluate $\int_c \bar{F}\cdot\overline{dr}$ along the curve $c$ in the $xy$–plane $y = x^3$ from $(1,1)$ to $(2,8)$. 6M



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