Sub Code:NAS103

Paper Id: 199123 Roll No:

B. TECH.
(SEM I) THEORY EXAMINATION 2019-20
ENGINEERING MATHEMATICS -I

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a.	Find y , if $y = x \log x$.
b.	If $u(x, y) = \sqrt{x} + \bar{y}$, find the value of x —— $+ 2xy$—— $+ y$ ——.
c.	Calculate $\frac{(\ ,\ )}{(\ ,\ )}$ for $x = e$ cos v, and $y = e$ sin v.
d.	Prove that $e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \ldots\ldots\ldots\ldots$.
e.	Find the rank of the matrix $\begin{matrix} 1 & 1 & 1 \\ 3 & 1 & 1 \end{matrix}$.
f.	Find the inverse of the matrix $A = \begin{matrix} 3 & 1 \\ 2 & 1 \end{matrix}$.
g.	Evaluate $x^2(1-x)^3\,dx$.
h.	Evaluate $x\,dydx$.
i.	Show that $\vec{F} = (x - y + x)\hat{i} - (2xy + y)\hat{j}$ is irrotational.
j.	State Gauss divergence theorem.

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a.	If $y = (\sin x)$, show that $(1 - x)y - (2n + 1)xy - n\,y = 0$ and calculate $y\ (0)$.
b.	Find the volume of the largest rectangular parallelopiped that can be inscribed in the ellipsoid —— $+$ —— $+$ —— $= 1$.
c.	Reduce the matrix $A = \begin{matrix} 1 & -1 & 2 \\ 0 & 2 & -1 \\ 0 & 0 & 3 \end{matrix}$ *to the diagonal form.*
d.	Find the volume of the solid surrounded by the surface $-$ $+$ $-$ $+$ $-$ $= 1$.
e.	Verify Stokes's theorem for $\vec{F} = x\,\hat{i} + xy\hat{j}$ integrated round the square whose sides are $x = 0, y = 0, x = a, y = a$ in the plane $z = 0$.

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SECTION C

3. Attempt any *one* part of the following: 10x1=10

a.	Trace the curve: $y^2(2a-x)=x^3$
b.	If $u=\log(x\ \ +y\ \ +z\ \ -3xyz)$, show that $(—+—+—)\,u=-\ \frac{}{(\quad)}$.

4. Attempt any *one* part of the following: 10x1=10

a.	Expand tan $\ -$ in the neighbourhood of $(1,1)$ upto and inclusive of second-degree terms. Hence compute $f(1.1,0.9)$ approximately.
b.	If u, v, w are the roots of the equation $(x-a)\ \ +(x-b)\ \ +(x-c)\ \ =0$, then find $\frac{\partial(u,v,w)}{\partial(a,b,c)}$.

5. Attempt any *one* part of the following: 10x1=10

a.	Find the value of λ such that the following equations have unique solution: $\lambda x+2y-2z-1=0,\ 4x+2\lambda y-z-2=0, 6x+6y+\lambda z-3=0$ and use matrix method to solve these equations when $\lambda=2$.
b.	Verify Cayley-Hamilton theorem for the matrix $A=\begin{matrix}1 & 2 & 0\\ 2 & -1 & 0\\ 0 & 0 & -1\end{matrix}$ and hence find A

6. Attempt any *one* part of the following: 10x1=10

a.	Show that in the Catenary $y=c\cosh -$, the length of arc from the vertex $x=0$ to any point (x,y) is given by $s=c\sinh -$.
b.	Evaluate —— by changing the order of integration.

7. Attempt any *one* part of the following: 10x1=10

a.	Find the directional derivative of $\emptyset=5x\ y-5y\ z+z\ x$ at the point $P(1,1,1)$ in the direction of the line —— = —— = –.
b.	Apply Green's theorem to evaluate $(2x\ \ -y\ \ )dx+(x\ \ +y\ \ )dy$ where C is the boundary of the area enclosed by the $x-axis$ and upper half of the circle $x\ \ +y\ \ =a\ \ $.