Sub Code:EAS103

Paper Id: 199233

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.	Evaluate y_n if $y = x^2 e^x$.
b.	If $x = \sqrt{u}$, $y = \sqrt{v}$ and $u = r\cos\emptyset$, $y = r\sin\emptyset$ then find $\frac{\partial(x,y)}{\partial(r,\emptyset)}$.
c.	If A is Hermitian matrix then show that iA is Skew Hermitian.
d.	Evaluate $\int_0^\infty x^{1/4} e^{-\sqrt{x}} dx$
e.	Show that $V = (x+3y)i + (y-3z)j + (x-2z)k$ is solenoidal.
f.	Find the value of k so that the equations $x+y+z=0, 4x+3y+kz=0, 2x+y+2z=0$ have a non trivial solution.
g.	If matrix A has eigan values 1, 2 and 0. Find the eigen values of marix $A^2 - 3I$.
h.	State Stoke's theorem.
i.	Find the nature of the curve $y^2 = x^3(2a-x)$ at the origin.
j.	Compute the percentage error of the volume of a cylinder when an error of 1 percent is made in each dimension.

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SECTION B

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

a.	If $y = \left[x + \sqrt{1+x^2}\right]^m$, find $y_n(0)$.
b.	A rectangular box, open at the top, is to have a given capacity 32 cc.. Find the dimensions of the box, requiring lest material for its construction.
c.	Diagonalize the matrix $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 1 & 0 \\ -1 & 3 & 4 \end{bmatrix}$.
d.	Find the volume of the solid surrounded by the surface $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} + \left(\frac{z}{c}\right)^{\frac{2}{3}} = 1.$
e.	Verify Green's theorem for $\oint[(xy+y^2)dx + x^2dy]$, where C is the closed curve of the region bounded by $y = x$ and $y = x^2$.

SECTION C

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

a.	Verify Euler's theorem for $u = tan^{-1}\frac{x^3+y^3}{x-y}$.
b.	Expand the function e^{xy} about point (1, 1) up to third degree terms.

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

a.	Prove that $u = x+y-z, v = x-y+z$, $w = x^2+y^2+z^2-2yz$ are not independent. Find the relation among them
b.	Evaluate $[(3.82)^2 + 2(2.1)^3]^{1/5}$ using theory of approximations.

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

a.	Investigate the values of α, β so that the equations $x + 2y + 3z = 6,\ x + 3y + 5z = 9,$ $2x + 5y + \alpha z = \beta$ have (i) no solution (ii) a unique solution (iii) an infinite no. of solutions.
b.	Find the condition for which the matrix $\begin{bmatrix} a + ib & -c + id \\ c + id & a - ib \end{bmatrix}$ is unitary.

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

a.	By changing order of integration of $\int_0^\infty \int_0^\infty e^{-xy} \sin px\, dxdy$, show that $\int_0^\infty \frac{\sin px}{x} dx = \frac{\pi}{2}$.
b.	Find the volume of the solid bounded by the sphere $x^2 + y^2 + z^2 = 4$ and the paraboloid $x^2 + y^2 = 3z$.

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

a.	Evaluate $\int\int A.\hat{n}\, dS$ where $A = (x + y^2)\hat{\imath} - 2x\hat{\jmath} + 2yz\hat{k}$ and S is the surface of the plane $2x + y + 2z = 6$ in first octant.
b.	Find the directional derivative of scalar function $\emptyset = xyz$ at the point P(1, 2, 3) in the direction of the outward unit normal to the surface $x^2 + y^2 + z^2 = 11$ through the point P.

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