## B. TECH.
### (SEM. I) THEORY EXAMINATION 2018-19
### ENGINEERING MATHEMATICS -I

*Time: 3 Hours*                                    *Total Marks: 100*

Note1:. Attempt all sections. If require any missing data; then choose suitably.

### SECTION-A

1. Attempt **ALL** the parts:                                    **(2x10 = 20)**

   (a) Find $y$ , if $y = sin\ x$ at $x = 0$.

   (b) If $u\ x, y = \sqrt{x} + \overline{y}$ , find the value of $x \dfrac{}{} + 2xy \dfrac{}{} + y \dfrac{}{}$.

   (c) Calculate $\dfrac{}{}$ for $x = e\ cos\ v$, and $y = e\ sin\ v$.

   (d) Prove that $f\ ax = f\ x + a - 1\ xf\ x + \dfrac{}{!}f\ x + \dfrac{}{!}f\ x + \cdots \ldots \ldots \ldots$.

   (e) Reduce the matrix $\begin{matrix} 1 & 1 & 1 \\ 3 & 1 & 1 \end{matrix}$ into normal form.

   (f) Find the inverse of the matrix $A = \begin{matrix} 3 & 1 \\ 2 & 1 \end{matrix}$.

   (g) Find the value of $\int x^{-}e^{\sqrt{}} dx$.

   (h) Evaluate $\int xe\ dydx$.

   (i) Show that $\vec{F} = x - y + x\ \hat{\imath} - 2xy + y\ \hat{\jmath}$ is irrotational.

   (j) State Gauss divergence theorem.

### SECTION – B

2. Attempt any **THREE** of the following:                                    **(10x3=30)**

   (a) If $y = sin\ a\ sin\ x$ , show that
   $1 - x\ y - 2n + 1xy - n - a\ y = 0$ and calculate $y\ 0$.

   (b) Find the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid $\dfrac{}{} + \dfrac{}{} + \dfrac{}{} = 1$.

   (c) Diagonalise the matrix $A = \begin{matrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{matrix}$.

   (d) Find the volume of the solid surrounded by the surface $\dfrac{-}{} + \dfrac{-}{} + \dfrac{-}{} = 1$.

   (e) Verify Stoke's theorem for $\vec{F} = x\ \hat{\imath} + xy\hat{\jmath}$ integrated round the square whose sides are $x = 0, y = 0, x = a, y = a$ in the plane $z = 0$.

3. Attempt any **TWO** of the following: (5x2=10)

   (a) Verify Euler's theorem for the function: $u = $ ⎯⎯

   (b) If $u = f\left(y - z, z - x, x - y\right)$, prove that ⎯ + ⎯ + ⎯ $= 0$.

   (c) Trace the curve: $y = x$.

4. Attempt any **TWO** of the following: (5x2=10)

   (a) Expand $\tan$ ⎯ in powers of $\left(x - 1\right)$ and $\left(y - 1\right)$ upto two degree terms.

   (b) Show that $u = $ ⎯⎯ , $v = $ ⎯⎯ , $w = $ ⎯⎯⎯ are not independent, find the relation among them.

   (c) Find the extreme values of $3x - y + x$.

5. Attempt any **TWO** of the following: (5x2=10)

   (a) Show that the system of equations:
   $x + 3y - 2z = 0,\ 2x - y + 4z = 0,\ x - 11y + 14z = 0$ has a non-trivial solution.

   (b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$ and hence find $A$ .

   (c) Prove that the each characteristic roots of a unitary matrix are of unit modulus.

6. Attempt any **TWO** of the following: (5x2=10)

   (a) Evaluate ⎯⎯ by changing the order of integration.

   (b) Prove that $\dfrac{\ }{\sqrt{\ }} = \dfrac{\ }{\sqrt{\ }} B,$ ⎯ .

   (c) Show that in the Catenary $y = c\cosh$ ⎯, the length of arc from the vertex $x = 0$ to any point $\left(x, y\right)$ is given by $s = c\sinh$ ⎯.

7. Attempt any **TWO** of the following: (5x2=10)

   (a) Find the directional derivative of $\emptyset = 5x\,y - 5y\,z + z\,x$ at the point $P\left(1,1,1\right)$ in the direction of the line ⎯ = ⎯ = ⎯.

   (b) Prove that $\operatorname{div}\left(\vec{a} \times \vec{b}\right) = \vec{b} \cdot \operatorname{curl}\vec{a} - \vec{a} \cdot \operatorname{curl}\vec{b}$

   (c) Apply Green's theorem to evaluate $\int \left(2x - y\right)dx + \left(x + y\right)dy$ where $C$ is the boundary of the area enclosed by the $x-axis$ and upper half of the circle $x + y = a$.

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