



PAPER ID-311462

Printed Page: 1 of 2
Subject Code: RAS103

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

BTECH
(SEM I) THEORY EXAMINATION 2023-24
ENGINEERING MATHS-I

TIME: 3HRS

M.MARKS: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 7 = 14

a.	Define Leibnitz theorem.
b.	If $u = \tan^{-1}(x^2 + y^2)$, then find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$.
c.	If $x = uv, y = \frac{u+v}{u-v}$, Find $\frac{\partial(u,v)}{\partial(x,y)}$
d.	Find the Eigen values of matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.
e.	Find the value of $\Gamma - 1/2$.
f.	State Green's theorem.
g.	Find the Value of k for which a vector $\vec{F} = (kx + 4y^2z)i + (x^3 \sin z - 3y)j - (e^x + 4\cos x^2 y)k$ is a Solenoidal Vector.

SECTION B

2. Attempt any three of the following:

7 x 3 = 21

a.	If $y = e^{m \cos^{-1} x}$ show that $(1-x^2) y_{n+2} - (2n+1) x y_{n+1} - (n^2+m^2) y_n = 0$, also calculate $y_n(0)$.
b.	If u, v, w are the roots of the equation $(\lambda - x)^3 + (\lambda - y)^3 + (\lambda - z)^3 = 0$, find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.
c.	Find the Eigen values and Eigen vectors of the following matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.
d.	Evaluate $\iiint x^{l-1} y^{m-1} z^{n-1} dx dy dz$, where x, y, z are all positive but limited by the condition $\left(\frac{x}{a}\right)^p + \left(\frac{y}{b}\right)^q + \left(\frac{z}{c}\right)^r \leq 1$
e.	Verify the Greens theorem to evaluate the line integral $\int (2y^2 dx + 3x dy)$, where C is the boundary of the closed region by $y = x$ and $y = x^2$.

SECTION C

3. Attempt any one part of the following:

7 x 1 = 7

a.	If $y^{\frac{1}{m}} + y^{-\frac{1}{m}} = 2x$ prove that $(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$
b.	Verify Euler theorem for $u = \log \left(\frac{x^4 + y^4}{x+y} \right)$.

4. Attempt any one part of the following:

7 x 1 = 7

a.	Expand $x^2 + 3y^2 - 9x - 9y + 26$ in powers of $(x - 1)$ and $(y - 2)$ by Taylor's theorem up to second degree term.
b.	In estimating the number of bricks in a pile which is measured to be $(5 \text{ m} \times 10 \text{ m} \times 5 \text{ m})$, the count of bricks is taken as 100 bricks per m^3 . Find the error in the cost when the tape is stretched 2 % beyond its standard length. The cost of bricks is 2000 Rs. per thousand bricks.



PAPER ID-311462

Printed Page: 2 of 2
Subject Code: RAS103

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

BTECH
(SEM I) THEORY EXAMINATION 2023-24
ENGINEERING MATHS-I

TIME: 3HRS

M.MARKS: 70

5. Attempt any one part of the following: 7 x 1 = 7

a.	Using Cayley - Hamilton Theorem find $A^{-1} \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$
b.	Investigate for what values of λ and μ do the system of the equation $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ has i) no solution ii) unique solution iii) infinite no.of solution.

6. Attempt any one part of the following: 7 x 1 = 7

a.	Change the order of integration $\int_1^2 \int_{x^2}^{2-x} f(x, y) dx dy$
b.	Prove that $\beta(m, n) = \beta(n, m)$.

7. Attempt any one part of the following: 7 x 1 = 7

a.	Suppose that \vec{U}, \vec{V} and f are continuously differentiable fields then Prove that $\text{div}(\vec{U} \times \vec{V}) = \vec{V} \cdot \text{Curl } \vec{U} - \vec{U} \cdot \text{Curl } \vec{V}$.
b.	A vector field is given by $F = (x^2 - y^2 + x)\hat{i} - (2xy + y)\hat{j}$. Is this field irrotational? If so find scalar potential.