



KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Engg.)
I Semester Re- Examination-November 2021
2019 Admission

Basc.1102

Engineering Mathematics I (3+0)

Marks: 50
Time: 2 hours
(10x1=10)

I Fill in the blanks:

1. If λ is the Eigen value of A, then $AX = \text{-----}$
2. The Quadratic form associated with the matrix $A = \begin{bmatrix} 1 & 4 \\ 4 & -2 \end{bmatrix}$ is-----
3. $\int_0^{\infty} e^{-x} x^{-\frac{1}{2}} dx = \text{-----}$
4. $\frac{\partial(u,v)}{\partial(r,s)} \times \frac{\partial(r,s)}{\partial(u,v)} = \text{-----}$
5. Cayley – Hamilton theorem states that every square matrix satisfies its-----
6. Maclaurin's series of $e^x = \text{-----}$
7. Rank of $\begin{bmatrix} 7 & 0 \\ 0 & 0 \end{bmatrix} = \text{-----}$
8. $\lim_{x \rightarrow \infty} \frac{x}{e^x} = \text{-----}$
9. Total differential of $z = \ln(xy)$ is-----
10. $\lim_{x \rightarrow 0} \frac{\sin 5x}{3x} = \text{-----}$

II Write short notes on ANY FIVE of the following

(5x2=10)

1. Find $\frac{\partial(x,y)}{\partial(r,\theta)}$ if $x = r \cos \theta$, $y = r \sin \theta$?
2. Write the formula for finding radius of curvature?
3. If 2 and 3 are Eigen values of matrix A, find Eigen values of A^2 and $4A$?
4. Evaluate $\int_0^{\frac{\pi}{2}} \cos^5 \theta d\theta$?
5. If $z = x + y$, where $x = at^2$, $y = 2at$, find $\frac{dz}{dt}$?
6. Verify whether $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$, if $u = xy$.
7. Find $\frac{dy}{dx}$, if $x^2 + y^2 = 1$?

III Answer ANY FIVE of the following

(5x4=20)

1. Find area bounded by the curves $y = x^2$ and $y^2 = x$ using double integrals?
2. Find the entire length of asteroid $x = a \cos^3 t$, $y = a \sin^3 t$?
3. Determine the value of λ for which the equations $3x + y - \lambda z = 0$, $4x - 2y - 3z = 0$, $2\lambda x + 4y + \lambda z = 0$ may possess non trivial solution?
4. Using Cayley-Hamilton theorem show that $A^3 - 5A^2 + 4A = 0$, if $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
5. If $H = f(x-y, y-z, z-x)$, prove that $\frac{\partial H}{\partial x} + \frac{\partial H}{\partial y} + \frac{\partial H}{\partial z} = 0$?
6. Change the order of integration and evaluate $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy dx$?
7. Evaluate $\int_0^4 \int_0^x \int_0^{x+y} z dz dy dx$

IV Write an essay on ANY ONE of the following

(1x10=10)

1. Find the Eigen values and Eigen vectors of $A = \begin{bmatrix} 3 & 0 & 0 \\ 5 & 4 & 0 \\ 3 & 6 & 1 \end{bmatrix}$?
2. Find the volume of the sphere $x^2+y^2+z^2 = a^2$ using triple integrals
