KERALA AGRICULTURAL UNIVERSITY
B.Tech (Food Engg.) 2019 Admission
I Semester Final Examination-January 2020

Basc.1102 **Engineering Mathematics-I (3+0)** **Marks:50**
Time: 2 hours

I **Fill in the blanks:** **(10x1=10)**

1. Equivalent matrices have the same _____.
2. $[AB]^T$= _____.
3. If R(A) ≠ R (A, B), then the equations are _____.
4. The eigen values of A and A^T are _____.
5. Every square matrix satisfies its own _____ equations.
6. The number of positive terms in the canonical form is called _____.
7. $\int e^{ax}\, dx$ = _____.
8. $\int_0^1 x^{m-1}\ (1-x)^{n-1}$ = _____.

Define

9. Define the linear dependence of a set of vectors.
10. Define J $(\frac{u,v}{x,y})$.

II **Write Short notes on ANY FIVE of the following** **(5x2=10)**

1. Find the rank of $\begin{bmatrix} 2 & 1 & -1 \\ 1 & 4 & 2 \\ 3 & 5 & 1 \end{bmatrix}$
2. State Rouche's theorem.
3. What do you mean by consistent and inconsistent system of equations?
4. Define eigen vectors of a matrix.
5. What do you mean by diagonalising a matrix?
6. Prove that the radius of curvature of a circle is its radius.
7. Evaluate $\int_0^2 \int_0^1 4xy\, dx\, dy$.

III **Answer ANY FIVE of the following** **(5x4=20)**

1. Show that the vectors (2, -2, 1), (1,4,-1) and (4, 6,-3) are linearly dependent.
2. Find the eigen values and eigen vectors of the matrix A = $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$
3. How the nature of the quadratic form can be determined without reducing to canonical form.
4. State and prove properties of Jacobian.
5. Discuss the maxima and minima of the function $f(x,y) = x^4+y^4-2x^2+4xy-2y^2$.
6. Evaluate $\int_0^1 \int_0^{\sqrt{1+y^2}} \frac{dxdy}{1+x^2+y^2}$
7. Find the volume of the portion of the cylinder $x^2+y^2 = 1$ intercepted between the plane $z = 0$ and the paraboloid $x^2+y^2 = 4 - z$.

IV **Write an essay on ANY ONE of the following** **(1x10=10)**

1. Diagonalise the real symmetric matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ through orthogonal reduction.
2. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \int_0^{\sqrt{a^2-x^2-y^2}} xyz\, dzdydx$ by transforming to spherical polar coordinates.

****