KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Engg.) 2012 & Previous Admission
Re-examination-January-2018

Basc.1102 **Engineering Mathematics I (3+0)** **Marks: 80**
Time: 3 hours

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

1 If λ is an eigen value of a matrix A, then-------------is an eigen value of A^{-1}.

2 The sum of the eigen values of a matrix A is equal to -------------

3 If $|A| > 0$, then the quadratic form X^TAX is -------------

4 Define symmetric matrix.

5 Define rank of a matrix.

6 State L'Hospital's rule for the indeterminate form $\frac{0}{0}$.

7 $\lim_{x\to 0}\frac{\sin x}{x}$ = -------------

8 Write the formula for radius of curvature in Cartesian form.

9 If u is a composite function of t defined by $u = f(x,y)$, $x = \varphi(t)$, $y = \psi(t)$, then the total derivative $\frac{du}{dt}$ = -------------

10 If δx is the error in x, then the relative error is-------------

II Write Short notes on any TEN of the following **(10x3=30)**

1 If u and v are functions of two independent variables x and y, then define the Jacobian of u,v with respect to x,y.

2 State Cayley Hamilton Theorem.

3 Define homogeneous function.

4 Define a quadratic form.

5 Find the eigen values of the matrix $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$.

6 Write the formula for Taylor series expansion of a function about the point x_0.

7 Define Gamma function.

8 State Euler's theorem for homogeneous function.

9 Write the matrix of the quadratic form $ax^2 + 2hxy + by^2$.

10 If $u = x^y$ find $\frac{\partial^2 u}{\partial x \partial y}$

PTO

11 Write the formula for Maclaurin's series expansion of a function

12 Define Beta function.

III Answer any SIX of the following. (6x5=30)

1 Derive the reduction formula for $\int \sin^n x \, dx$.

2 Using the formula for volumes of revolution, derive the volume of a sphere of radius a.

3 Verify Cayley Hamilton Theorem for the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and hence find its inverse.

4 Find the rank of the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$ by reducing to its normal form.

5 Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

6 Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if $z = x^3 + y^3 - 3axy$.

7 Evaluate $\Gamma(\frac{1}{2})$

8 If $u = \tan^{-1}(x+y)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{\sin 2u}{2}$.

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

1 Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to its canonical form and specify the matrix of the transformation.

2 Find the area enclosed between the curves $y^2 = 4ax$ and $x^2 = 4ay$ using double integral.

****