KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food. Engg) 2012 Admission

I[st] Semester Final Examination- January/February -2013

Cat. No: Basc.1102 **Marks: 80**

Title: Engineering Mathematics -I (3+0) **Time: 3 hours**

PART I

Answer all Questions $10 \times 1 = 10$

1. If A is a saquare matrix of order n, then what is determinant of -A.
2. Define symmetric and skew symmetric matrices.
3. If A is a non singular matrix of order n , then what is the rank of A.
4. What is the curvature of a circle of radius r at any point.
5. Evaluate $limit_{x\to 1, y\to 2} \frac{2x^2y}{x^2+y^2+1}$
6. Find $\int_0^{\frac{\pi}{2}} \sin^4 x dx$
7. What is the length of the arc of the curve y = f (x)between the points x =a and x=b.
8. What is the relation between beta and gamma functions.
9. What is the value of $\frac{\partial^2 u}{\partial x^2}$ where u = xy $+y^2$ + 2xz.
10. Find $limit_{x\to 0} \frac{sinx}{x}$

PART II

Answer any ten Questions $10 \times 3 = 30$

1. If $A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{pmatrix}$ .and $B = \begin{pmatrix} 1 & -2 \\ -1 & 0 \\ 2 & -1 \end{pmatrix}$. Find the product AB.
2. Prove that $(AB)^{-1} = B^{-1}A^{-1}$ where A and B are two square matrices of the same order.
3. Test for consistency and then solve 5x + 3y +7z =4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5.
4. Evaluate $limt_{x\to 0} \frac{xe^x - log(1+x)}{x^2}$
5. Define curvature , radius of curvature, and center of curvature of a curve at any point.
6. If$u = (x^2+y^2+z^2)^{\frac{-1}{2}}$, prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$
7. If z = f (x,y) and $x = e^u + e^{-v}, y = e^{-u} - e^v$ prove that $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$

8. If $x = rCos\theta$, and $y = rSin\theta$, then show that $\frac{\partial(x,y)}{\partial(r,\theta)}$ =r.
9. Evaluate $\int_0^{\frac{\pi}{6}} Cos^4(3\theta)Sin^3(6\theta)d\theta$
10. Find the reduction formula for $\int x^n e^{ax} dx$
11. Find the volume of the sphere of radius a.
12. Find the surface area of the solid generated by revolving the cardiod r=a(1+$cos\theta$) about the initial line.

PART III

Answer any six Questions $6 \times 5 = 30$

1. Prove that $A^3 - 4A^2 - 3A + 11I = 0$ where $A = \begin{pmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{pmatrix}$
2. Find the inverse of $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{pmatrix}$
3. Examine the polynomial function given by $f(x) = 10x^6 - 24x^5 + 15x^4 - 40x^3 + 108$for maximum and minimum values .
4. Expand $log(1 + \sin^2 x)$ in powers of x as far as the term x^5
5. Find the cordinates of the center of curvature at any point of the parabola $y^2 = 4ax$. Hence show that it's evolute is $27ay^2 = 4(x - 2a)^3$.
6. Trace the curve r=a sin3θ
7. If$u = sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ Prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}tanu.$
8. Evaluate $\int_0^a \frac{x^7 dx}{\sqrt{a^2 - x^2}}$

PART IV

Answer any one Question. $1 \times 10 = 10$

1. a) Find the eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$

   b) Prove that if λ is an eigenvalue of A,then $\frac{1}{\lambda}$ is an eigen value of A^{-1}
2. a) By changing the order of integration of $\int_0^\infty \int_0^\infty e^{-(xy)} sin(px) dx dy$, show that $\int_0^\infty \frac{sinpx}{x} dx = \frac{\pi}{2}$

   b) Evaluate $\int\int r sin\theta dr d\theta$ over the cardiod $r = a(1 - cos\theta)$ above the initial line .

   c) Define Beta function