KERALA AGRICULTURAL UNIVERSITY
B.Tech (Food Engineering) 2018 Admission
I Semester Final Examination-January 2019

Basc.1102 **Engineering Mathematics I (3+0)**

Marks: 50
Time : 2 hours

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

1 If λ is the Eigen value of A, then Eigen value of A^2 is_____

2 A matrix is diagonalizable, if its Eigen vectors are linearly _____

3 If $x = r\cos\theta$, $y = r\sin\theta$, then $\frac{\partial(r,\theta)}{\partial(x,y)}$ is _____

4 $\beta\left(\frac{1}{2},\frac{1}{2}\right) =$ _____

5 $\lim_{x\to 0}\frac{x-\sin x}{x^3} =$ _____

6 If $\sqrt{x}+\sqrt{y} = 0$, then $\frac{dy}{dx} =$ _____

7 If $u = x^2 + y^2$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$ _____

8 Vertical asymptote of $\frac{x^2+2x-1}{x}$ is _____

9 $\int_0^{\frac{\pi}{2}} sin^4\theta\, d\theta =$ _____

10 Curvature of y = ax + b at (x, y) is _____

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

1 Find the Eigen values of $\begin{bmatrix} 1 & -4 \\ -2 & 3 \end{bmatrix}$

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

3 Find rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \end{bmatrix}$

4 Write Maclaurin's series expansion of $\cos x$

5 *Find* $\lim_{x\to 0} x \ln x$

6 Find the matrix corresponding to the Quadratic form.
$5x_1^2 - 4x_2^2 + 7x_3^2 + 4x_2x_3 + 2x_3x_1 - 6x_1x_2$

7 Evaluate $\int_0^{\infty} e^{-x^2} dx$

P.T.O

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

1 Find the values of 'a' and 'b' for which the system of equations $x + 2y + 3z = 4, x + 3y + 4z = 5, x + 3y + az = b$ have no solution

2 Find the radius of curvature at any point (x, y) on the rectangular hyperbola $xy = c^2$.

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

4 Evaluate $\iint xy\, dx\, dy$ over the region bounded by $x = 0, y = 0, x + y = 1$.

5 Evaluate $\lim_{x \to \frac{\pi}{2}} (\sin x)^{\tan x}$

6 Find the percentage error in calculating area of a rectangle due to an error of 1% made in measuring sides?

7 Evaluate $\int_0^\infty e^{-\sqrt{x}}\, x^{\frac{1}{4}}\, dx$

IV **Answer ANY ONE of the following** **(1x10=10)**

1 Show that the system of equations $x + y + z = 4$

2 If $V = \frac{1}{r}$, where $r^2 = x^2 + y^2$, show that $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = \frac{1}{r^3}$

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