KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.)
I Semester Final Re - Examination – February 2025
2023 & Previous Admission

Sacs.1101   **Engineering Mathematics I (2+1)**   **Marks: 50**
Time: 2 hours

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

1.   If u is homogeneous function of degree n, then $x^2 \frac{d^2u}{dx^2} + 2xy \frac{d^2u}{dxdy} + y^2 \frac{d^2u}{dy^2} =$

2.   A function must be ……………….. in order to be expressed as Taylor's expansion.

3. $\lim\limits_{(x,y)\to(0,0)} \frac{x+y}{x+2y} =$

4. $\lim\limits_{n\to\infty} (1+n)^{\frac{1}{n}} =$

5.   If $Mdx + Ndy = 0$ is non exact but homogeneous then integrating factor is given by

6. $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \cdots \ldots \ldots \ldots =$

7.   If $\nabla \times \vec{V} = 0$ then $\vec{V}$ is…………………..

8. $\vec{\nabla} \times (\vec{A}.\vec{B}) =$

9.   The degree of differential equation $\frac{d^2y}{dx^2} = \cos(\frac{dy}{dx})$.

10. The particular integral of $f(D)y = e^{ax}$ is

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

1.   Solve $\lim\limits_{x\to-\infty} \frac{x^2}{e^{1-x}}$

2.   Find the asymptotes of $x^2y^2 - xy^2 - x^2y + x + y + 1 = 0$.

3.   Solve $(3x^2 + 6xy^2)dx + (6x^2y + 4y^3)dy = 0$

4.   Write Rodrigue's formula and hence prove that $P_0(x), P_1(x)$ and $P_2(x)$

5.   Change the order of integration in $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}} dydx$.

6.   If $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$, show that $\mathrm{grad}\left(\frac{1}{r}\right) = -\frac{\vec{r}}{r^3}$

7.   Solve $p = \sin(y - px)$.

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

1.   Find the series solution of the differential equation $\frac{dy}{dx} + y = 0$.

2.   Find volume of ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

3.   If $u = x^y$, show that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial z}$.

4.   Discuss maxima and minima of $x^3 + y^3 - 3axy$.

5.   Use method of variation of parameters to solve $\frac{d^2y}{dx^2} + y = \mathrm{cosec}\, x$.

6.   Solve $x\frac{dy}{dx} + y = x^3y^6$.

7.   Find directional derivative of $\varphi = xy^2 + yz^2$ at the point (2,-1,1) in the direction of $\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$.

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

1. Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy$ taken over $y = \sqrt{x}$, $y = x^2$.

2. Solve $(1 + x)^2 \dfrac{d^2y}{dx^2} + (1 + x)\dfrac{dy}{dx} + y = \sin[2\log(1 + x)]$

****