KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.)
I Semester Final Re - Examination – February 2026
2023 & Previous Admissions

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

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

1. The vertical asymptote of the curve $(2x+3)y=(x-1)^2$ is ....
2. The complementary function of the differential equation $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$ is ....
3. The integrating factor of the differential equation $\sin x\frac{dy}{dx}+2y=\tan^3\left(\frac{x}{2}\right)$ is ....
4. A force field vector $\vec{F}$ is said to be conservative if ....
5. Let function f(x) have a second derivative at *c* such that f'(*c*) =0 and f "(*c*)>0, then *c* is the point of...............

State True or False

6. The function $f(x,y)=12x^{20}y^{51}+16x^{23}y^{48}$ is homogeneous.
7. For the functions $f(x)=x+4$ and $g(x)=x+6$, $f(g(x))=g(f(x))$.
8. The differential equation $M(x,y)dx+N(x,y)dy=0$ is an exact differential equation if $\frac{\partial M}{\partial y}=\frac{\partial N}{\partial x}$.
9. The value of $grad\left(curl\vec{F}\right)$ is 0.
10. The equation $y=px^2+f(p)$ is known as Clairaut's equation.

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

1. Evaluate $\lim_{x\to 1}\frac{x-1}{x^n-1}$.
2. Find the surface area of the solid generated by revolving the circle $x^2+(y-b)^2=a^2, b\ge a$ about the x-axis.
3. Solve $(2x-y+1)dx+(2y-x-1)dy=0$.
4. Solve $(D^2+1)y=\cos 2x$
5. Solve the simultaneous equations given by $\frac{dx}{dt}-7x+y=0$ and $\frac{dy}{dt}-2x-5y=0$.
6. Find the divergence of $\vec{v}=(xyz)\hat{i}+(3x^2y)j+(xz^2-y^2z)k$ at (2, -1, 1).
7. A fluid motion is given by $\vec{v}=(y+z)\hat{i}+(z+x)j(x+y)k$. Show that the motion is irrotational.

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

1. State Euler's theorem and verify it for $f(x,y,z)=7x^2yz+3xy^2z+9xyz^2$.
2. Find the volume of the solid generated by revolving the region bounded by $y=\sqrt{x}, y=0$ and $y=9$ about the y-axis.
3. If $\vec{A}$ is a constant vector and $\vec{R}=x\hat{i}+y\hat{j}+zk$ then prove that $curl\left[\left(\vec{A}.\vec{R}\right)\vec{R}\right]=\vec{A}\,X\,\vec{R}$.
4. Evaluate $\int_C \vec{F}.d\vec{r}$ where $\vec{F}=x^2\hat{i}+xy\,j$ and C is the boundary of the square in the plane z = 0 and bounded by the lines $x = 0$, $y = 0$, $x = a$ and $y = a$.
5. Solve $\left(x^2y-2xy^2\right)dx-\left(x^3-3x^2y\right)dy=0$.
6. Solve $\left(D^2-3D+2\right)y=e^{3x}$.
7. Solve the following differential equation in series $\left(1-x^2\right)\frac{d^2y}{dx^2}-x\frac{dy}{dx}+4y=0$.

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

1. Write the steps to trace the curve in Cartesian coordinates and then trace the curve $ay^2=x^2\left(a-x\right)$.
2. Write the Legendre differential equation and find its series solution.

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