KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology)
I Semester Final Re - Examination – February 2026
2023 & Previous admission

Beas.1102 | **Engineering Mathematics I (2+0)** | **Marks: 50**
Time: 2 hours

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

1. The term extreme value is used for both .... and .... value.
2. A point (a,b) is .... point if it tells the first order PDE of f(x,y) vanish at that point.
3. A curve in the xy plane is the graph of the function if and only if there is no ....that intersects the curve more than once.
4. $\left(\frac{dy}{dx}\right) + Py = Qy^n$ in which n is constant except 0 and 1, then it is called as ....
5. In a conservative vector field of $\vec{F} = \nabla\emptyset$, then $\vec{F}$ is_said to be as...........
6. A symbol that represents a number in the range of f is called ....
7. If a unique scalar is denoted by $\emptyset(\vec{r})$ in a function R, then $\emptyset$ is called as ....
8. The directional derivative is minimum when $\cos\theta$ is ....

Answer the following

9. What can be derived directly from the general solution by differentiating without any elimination?
10. What is the characteristic equation of non-trivial solution?

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

1. Expand $\log(x + a)$ in powers of x by Taylor's Theorem
2. Solve $(\frac{dy}{dx})$+xsin $2y = x^3cos^2y$.
3. Reduce $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 3y = x$ into a differential equation with constant coefficient.
4. Prove that $\nabla \times \nabla\emptyset = \vec{0}$ where $\emptyset$ is a scalar point function.
5. If $u = x(1 - r^2)^{-\frac{1}{2}}, v = y(1 - r^2)^{-\frac{1}{2}}, w = z(1 - r^2)^{-\frac{1}{2}}$ where $r^2 = x^2 + y^2 + z^2$, show that $J(u, v, w) = (1 - r^2)^{-\frac{5}{2}}$.
6. Solve for x and y if $\frac{dy}{dt} = x, \frac{dx}{dt} = y$.
7. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - z = 3$ at the point (2,-1,2).

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

1. Expand $\cos x$ by Maclaurin's series.
2. Test whether the equation $(x + y)^2dx - (y^2 - 2xy - x^2)dy = 0$ is exact.
3. Solve $\frac{dx}{dt}$=3x+8y, $\frac{dy}{dt}$=-x-3y, x(0)=6, y(0)=-2.
4. Find the unit normal vector to the surface $x^3 + y^3 + 3xyz = 3$ at (1,2,-1)
5. Discuss the maximum or minimum values of u given by $u = x^3y^2(1 - x - y)$.
6. Solve $\frac{dx}{dt} + y = e^t, x - \frac{dy}{dt} = t$.
7. Find the directional derivative of $\emptyset = xyz$ at (1,1,1) in the direction of $\vec{i} + \vec{j} + \vec{k}$.

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

1. If $u = \tan^{-1}\frac{x^3+y^3}{x-y}$, $x \neq y$, show that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = (1 - 4sin^2 u)sin2u.$
2. Verify Stokes's theorem for $\vec{F} = y^2 z\vec{i} + z^2 x\vec{j} + x^2 y\vec{k}$ where S is the open surface of the cube formed by the planes $x = -a, x = a, y = -a, y = a, z = -a, z = a$ in which $z = -a$ is cut open.

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