



KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology) 2023 Admission
I Semester Final Examination – February 2024

Beas 1102

Engineering Mathematics - I (2+0)

Marks: 50
Time: 2 hours

I Fill in the blanks

(10x1=10)

1. $\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}} = \underline{\hspace{2cm}}$
2. An asymptote of a curve is a tangent at $\underline{\hspace{2cm}}$.
3. $e^{\int P dx}$ is called $\underline{\hspace{2cm}}$ of the linear differential equation $\frac{dy}{dx} + Py = Q$
4. A differential equation $M dx + N dy = 0$ is said to be $\underline{\hspace{2cm}}$, if $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
5. The equation $\frac{dy}{dx} + Py = Qy^n$ is called $\underline{\hspace{2cm}}$ equation.
6. \vec{F} is said to be $\underline{\hspace{2cm}}$, if $\nabla \cdot \vec{F} = 0$
7. If \vec{R} is the position vector of a point, then $\text{curl } \vec{R} = \underline{\hspace{2cm}}$

Answer the following

8. Define the order of a differential equation.
9. Write the Legendre's differential equation.
10. State Divergence theorem.

II Write short notes on ANY FIVE of the following

(5x2=10)

1. Write the Maclaurin's series expansion of $\sin x$.
2. Evaluate $\lim_{x \rightarrow 0} \tan x \log x$
3. Find the integrating factor of $x \log x \frac{dy}{dx} + y = \log x^2$
4. Solve the equation $(D^2 + 6D + 9)y = 0$
5. Find the particular integral (P.I) of $(D^2 + 5D + 6)y = e^x$
6. Find the Wronskian of the functions $y_1 = e^x$ and $y_2 = e^{-x}$
7. Evaluate $\text{div } F$ at the point (1,2,3) given $\vec{F} = 3x^2\hat{i} + 5xy^2\hat{j} + 5xyz^3\hat{k}$

III Answer ANY FIVE of the following

(5x4=20)

1. Find the first and second partial derivative of $z = x^3 - y^3 + 3axy$
2. Find the maximum and minimum points of $2(x^2 - y^2) - x^4 + y^4$
3. If $u = x \log xy$, where $x^3 + y^3 + 3xy = 1$, find $\frac{du}{dx}$
4. Using method of variation of parameters, solve $(D^2 + 4)y = \tan 2x$
5. Derive the value of $J_{-1}^{\frac{1}{2}}(x)$
6. Evaluate $\text{div } F$ at the point (1,2,3) given, $\vec{F} = x^2yz\hat{i} + xy^2z\hat{j} + xyz^2\hat{k}$
7. Using Green's theorem, evaluate $\int_C (y - \sin x)dx + \cos x dy$, where C is the plane triangle enclosed by the lines

IV Write an essay on ANY ONE of the following

(1x10=10)

1. Verify divergence theorem for \vec{F} taken over the cube bounded by $x=0, x=1; y=0, y=1; z=0, z=1$ where $\vec{F} = x^2\hat{i} - z\hat{j} + yz\hat{k}$
2. Find the complete solution of $(D^2 - 2D + 2)y = x + e^x \cos x$
