KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology) 2022 Admission
I Semester Final Examination – March 2023

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

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

1. The Taylor series expansion of the function cosh(x) centered at x = 0 is ....
2. The necessary condition for the maclaurins expansion to be true for function f(x) is ....
3. Degree of ODE $\frac{d^2y}{dx^2}+2\left(\frac{dy}{dx}\right)^2 = x^2$ is ....
4. Integrating factor of the differential equation $\frac{dy}{dx} + y\cos x = \frac{\sin 2x}{2}$ *is* ....
5. The Jacobian J = $\frac{\partial(x, y)}{\partial(u, v)}$ = ...
6. If $rt - s^2 < 0$ for certain point, then the point is known as ....
7. Relationship between surface and volume integral is .... theorem.
8. Del operator is also known as ....
9. Let $x\hat{i} + y\hat{j} + z\hat{k}$ and $r = |\bar{r}|$. Then ∇e^r= ....

State True or False

10. $f(x, y) = x^3 + xy^2 + 901$ does not satisfies the Euler's theorem.

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

1. Expand $\log(1+\sin^2 x)$ in powers of x as far as the term in x^6.
2. Evaluate $\underset{x\to 0}{\text{Lt}} \frac{xe^x - \log(1+x)}{x^2}$
3. Explain about Clairaut's equation.
4. State Bernoulli's equation.
5. Find the Complementary function for $(D^2 + \Delta - 2)\ \psi = e^x$
6. Calculate $\int_c \vec{f}\,\vec{dr}$ where $\vec{f} = (y^2 + z^2)\vec{i} + (z^2 + x^2)\vec{j} + (x^2 + y^2)\vec{k}$ and c is the trangle line joining (0,0,0) to (1,1,1)
7. Define div grad **F**.

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

1. Expand $\text{Sin}^2 x$ Using Maclaurin's series.
2. Explain the working rule to find the maximum and minimum values of f(x,y).
3. Solve $\frac{dy}{dx} = \sin(x+y) + \cos(x+y)$
4. Solve $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = e^{-2x}$
5. State Greens theorem.
6. If $A = 5t^2i + tj - t^3k$, $B = \sin t\, i - \cos t\, j$. Find $\frac{d}{dt}(A \times B)$
7. Prove that $A = 3y^4 z^2\,\bar{i} + 4x^3 z^2\,\bar{j} - 3x^2 y^2\,\bar{k}$ is a solenoidal vector

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

1. Find the maximum and minimum values of $f(x, y) = x^3 + y^3 - 3axy$.
2. Verify Stokes' theorem for $\overline{F} = y^2 z\,\overline{i} + z^2 x\,\overline{j} + x^2 y\,\overline{k}$ where S is the open surface of a cube formed by the $x = \pm a$, $y = \pm a$, $z = \pm a$ in which the plane $Z = -a$ is cut.

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