KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology) 2020 Admission
I Semester Final Examination-November 2021

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

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

1. $\lim_{x\to 0}\frac{\sin x}{x} =$ __________
2. A tangent to a curve at infinity is called ____________.
3. A differential equation is said to be __________ if the dependent variable and its differential coefficient occur only in the first degree and not multiplied together.
4. A differential equation $M\,dx + N\,dy = 0$ is said to be exact if __________.
5. An equation of the form $y = px + f(p)$ is known as ___________ equation.
6. $\bar{F}$ is said to be __________, if $\nabla \times \overline{F = 0}$
7. If $\hat{R}$ is the position vector of a point, then $div\ \hat{R} =$ _________.

Answer the following

8. Define degree of a differently equation.
9. Write the Bessel's differential equation of order n.
10. State Stoke's Theorem.

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

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

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

1. Find the first and second partial derivatives of $z = x^3 + y^3 - 3axy$.
2. Find the maximum and minimum points of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$.
3. Given $u = \sin\frac{x}{y}, x = e^t$ and $y = t^2$, find $\frac{du}{dt}$ as a function of t.
4. Using method of variation of parameters, solve $(D^2 - 1)y = \frac{2}{(1+e^x)}$
5. Derive the value of $J_{\frac{1}{2}}(x)$
6. Evaluate $curl\ F$ at the point (1,2,3) given $\hat{F} = 3x^2\hat{\imath} + 5xy^2\hat{\jmath} + 5xyz^3\hat{k}$
7. Using Green's theorem, evaluate $\int_c (2x^2 - y^2)dx + (x^2 + y^2)dy$ where C is the boundary of the area enclosed by x-axis and the upper half of the circle $x^2 + y^2 = a^2$

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

1. Verify divergence theorem for $\hat{F}$ taken over the cube bounded by $x=0, x=1; y=0, y=1; z=0, z=1$ where $\hat{F} = 4\,xz\hat{\imath} - y^2\hat{\jmath} + yz\hat{k}$
2. Solve $(D^2 + 3D + 2)y = e^{-x} + x^3 + \sin x$

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