KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agrl. Engg.) 2021 Admission
I Semester Final Examination- May 2022

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

Time: 2 hours

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

1. The $(n + 1)^{\text{th}}$ term in Maclaurins's series is _____.
2. The necessary condition for a function $f(x)$ to have a maxima at $x = c$ is that _____.
3. $\lim\limits_{x \to 0} x \log x$ is equal to _____.
4. If $x = u(1 + u)$, $y = v(1 + u)$, then the Jacobian of x, y with respect to u, v is _____.
5. Gradient of 2 is _____.
6. grad $(\phi\psi)$ = _____.
7. $\lim\limits_{x \to 0} \dfrac{\sin x}{x}$ is equal to _____.

Answer the following

8. Define stationary value.
9. Define divergence of a continuously differentiable vector point function **f**.

State True or False

10. $\nabla\phi$ is a scalar.

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

1. Find the first order partial derivatives of $\tan^{-1}(x + y)$.
2. If $x = r \cos \theta$, $y = r \sin \theta$, then find $\dfrac{\partial(x,y)}{\partial(r,\theta)}$.
3. Find the volume of the solid obtained by revolving the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ about the axis of x.
4. State Stoke's theorem.
5. If $x = a(\cos t + t \sin t)$, $y = a(\sin t - t \cos t)$, find d^2y/dx^2.
6. Evaluate $\lim\limits_{x \to 0} \dfrac{\log x}{\cot x}$.
7. Define homogeneous function.

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

1. Expand $\cos x$ using Maclaurin's series.
2. Find the first order partial derivatives of e^{x-y}.
3. Expand the function $x \operatorname{cosec} x$ in series form.
4. Evaluate $\lim\limits_{x \to 0} \dfrac{(1+x)^{1/x} - e}{x}$.
5. If $\theta = t^n e^{-\frac{r^2}{4t}}$, what value of n will make $\dfrac{1}{r^2} \dfrac{\partial}{\partial r}\left(r^2 \dfrac{\partial \theta}{\partial r}\right) = \dfrac{\partial \theta}{\partial t}$?
6. If $u = x^2 - y^2$, $v = 2xy$ and $x = r \cos \theta$, $y = r \sin \theta$, find $\dfrac{\partial(u,v)}{\partial(r,\theta)}$.
7. Evaluate $\iint_A xy \; dx \; dy$, where A is the domain bounded by x-axis, ordinate $x = 2a$ and the curve $x^2 = 4ay$.

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

1. Find the volume of the solid obtained by revolving the lemniscate $r^2 = a^2 \cos 2\theta$ about the initial line.

2. Evaluate $\int_S \mathbf{F}.\mathbf{n} \ ds$, where $\mathbf{F} = 2x^2 y\mathbf{i} - y^2\mathbf{j} + 4xz^2\mathbf{k}$ ans S is the closed surface of the region in the first octant bounded by the cylinder $y^2 + z^2 = 9$ and the planes $x = 0$, $x = 2$, $y = 0$ and $z = 0$.

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