**B.Sc DEGREE EXAMINATION,APRIL 2019**
**II Year IV Semester**
**Allied Mathematics-II**

**Time : 3 Hours** **Max.marks :75**

**Section A** $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define Fourier Coefficients.
2. Find the constant $\mathbf{a_0}$ of the Fourier series for the function $\mathbf{f(x)} = \mathbf{x}^2$ in $\mathbf{0} \leq \mathbf{x} \leq \mathbf{2}\pi$.
3. Define complete integrals.
4. Eliminate the arbitrary function f from $\mathbf{f(x}y\mathbf{+z^2, x+y+z)} = \mathbf{0}$.
5. Define Laplace transform.
6. Solve Laplace transform of $f(x) = 1$.
7. Write any two properties of inverse Laplace transform.
8. Find the inverse Laplace transform of $\frac{\mathbf{s}}{(\mathbf{s^2+16})}$.
9. Define Gradient of a scalar point function.
10. Find the unit normal vector to the surfaces $\mathbf{x^2+y^2+z^2=1}$ at the point (1,1,1).
11. If $\overrightarrow{\mathbf{r}} = \mathbf{x}\,\overrightarrow{\mathbf{i}} + \mathbf{y}\,\overrightarrow{\mathbf{j}} + \mathbf{z}\,\overrightarrow{\mathbf{k}}$, Show that $\nabla \cdot \overrightarrow{\mathbf{r}} = \mathbf{3}$.
12. State and prove the first shifting theorem on Laplace transform.

**Section B** $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Find the Fourier series for $\mathbf{f(x)}$ in $(-\pi, \pi)$ if $\mathbf{f(x)} = \begin{cases} \mathbf{0}, & -\pi < \mathbf{x} < \mathbf{0}, \\ \pi, & \mathbf{0} < \mathbf{x} < \pi, \end{cases}$
14. Solve the equation $\mathbf{p^2+q^2=x+y}$
15. Evaluate $\mathbf{L}\left[\mathbf{e^{2t}s}in^{\mathbf{3}}\mathbf{t}\right]$.
16. Evaluate $\mathbf{L^{-1}}\left[\frac{\mathbf{1}}{(\mathbf{s+1})(\mathbf{s+2})}\right]$.
17. If $\mathbf{f(r)} = \mathbf{r^n}$, then prove that $\nabla \mathbf{r^n} = \mathbf{nr^{n-2}}\overrightarrow{\mathbf{r}}$ where $\overrightarrow{\mathbf{r}}$ is the position vector.
18. Find the Fourier series for $\mathbf{f(x)} = \mathbf{x}$ in the interval $(\mathbf{0}, \mathbf{2}\pi)$.

19. Form the Partial differential equation by eliminating the arbitrary function $\mathbf{f}$ from $\mathbf{z}=\mathbf{f}\left(\frac{\mathbf{x}y}{\mathbf{z}}\right)$.

**Section C** $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Find the Fourier series for the function $\mathbf{f}(\mathbf{x}) = |\mathbf{x}|$ in $-\pi \leq \mathbf{x} \leq \pi$. Deduce that $\frac{\mathbf{1}}{\mathbf{1^2}}+\frac{\mathbf{1}}{\mathbf{3^2}}+\frac{\mathbf{1}}{\mathbf{5^2}}+\frac{\mathbf{1}}{\mathbf{7^2}}+\cdots=\frac{\pi^{\mathbf{2}}}{\mathbf{8}}$
21. Solve $\mathbf{x}\,(\mathbf{y}-\mathbf{z})\,\mathbf{p}+\mathbf{y}\,(\mathbf{z}-\mathbf{x})\,\mathbf{q}=\mathbf{z}(\mathbf{x}-\mathbf{y})$
22. Evaluate $\mathbf{L}\left[\frac{\mathbf{e^t}-\mathbf{e^{2t}}}{\mathbf{t}}\right]$
23. Evaluate $\mathbf{L}^{-1}\left[\frac{\mathbf{s}+\mathbf{2}}{(\mathbf{s^2}+\mathbf{4s}+\mathbf{5})^{\mathbf{2}}}\right]$
24. Verify Green's theorem for $\int_C \left(x^2+y^2\right) dx - 2xydy$ where C is the rectangle in the $xy$ plane bounded by $y=0, y=b, x=0, x=a$.

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