QP CODE: 23106074

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) IMPROVEMENT / REAPPEARANCE EXAMINATIONS, MARCH 2023

Fourth Semester

COMPLEMENTARY COURSE- MM4CMT01 - MATHEMATICS - FOURIER SERIES, LAPLACE TRANSFORM AND COMPLEX ANALYSIS

(Common for B.Sc Chemistry Model I, B.Sc Chemistry Model II Industrial Chemistry, B.Sc Chemistry Model III Petrochemicals, B.Sc Electronics and Computer Maintenance Model III, B.Sc Food Science & Quality Control Model III, B.Sc Geology and Water Management Model III, B.Sc Geology Model I, B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2017 Admission Onwards

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Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Define Fourier Cosine Series.
2. Define a power series with examples.
3. Find $\mathscr{L}(e^{at})$.
4. Evaluate $\mathscr{L}^{-1}(\frac{2}{s} + \frac{1}{s+2})$.
5. Write a relation between $\mathscr{L}\{\int_0^t f(t)dt\}$ and $\mathscr{L}\{f(t)\}$.
6. Find the real and imaginary parts of $z_1 z_2$ where $z_1 = 8 - 3i$ and $z_2 = 9 + 2i$.
7. Find the real and imaginary parts of $\frac{1}{z}$ where $z = 4 - 5i$.
8. Represent $z = 1 + i$ in the polar form.
9. What is the period of the complex function $sinz$.?
10. Write any two properties of line integral.
11. What is principle of deformation of path?
12. State Liouville's Theorem.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Find the fourier series expansio of $f(x) = \frac{\pi - x}{2}, 0 < x < 2\pi, f(x + 2\pi) = f(x)$ and deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \dots$
14. Find fourier series of $f(t) = 1 - t^2, -1 < t < 1$ with period $2L = 2$
15. By shifting find $\mathscr{L}(cosh\ at)$
16. Solve $y'' - y = t$ given $y(0) = 1$ and $y'(0) = 1$ using Laplace Transforms.
17. Find and plot all the cube roots of $8i$.
18. Check the analyticity of $\frac{i}{z^5}$
19. Find the real and imaginary parts of $cosh(-3 - 6i)$.
20. Find an upper bound for the absolute value of the integral $\int_C z^2 dz$, where C is the straight line segment from 0 to 3+ 4i.
21. Evaluate $\oint_C \frac{z^2-1}{z^2+1} dz$ using Cauchy's integral formula, C is the circle |z| = 2.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. Write the Ledendre's equation and then derive its solution by power series method. Also differentiate between Legendre polynomials and Legender functions.
23. Find (a) $\mathscr{L}\{t^2 e^{at} \sin bt\}$ (b) $\mathscr{L}^{-1}\{\log(1 + \frac{a^2}{s^2})\}$
24. Verify that $u = x^2 - y^2 - y$ is harmonic or not in the entire complex plane and find a conjugate harmonic function v of u. Also find the corresponding analytic function $f(z)$.
25. Integrate the following functions in the counter clockwise sense around the circle |z| = 2.

    a) $\frac{z^4}{(z-3i)^2}$ b) $\frac{z^3}{(z+1)^3}$

(2×15=30)