QP CODE: 23123514

23123514

Reg No : ....

Name : ....

B.Sc DEGREE (CBCS) REGULAR EXAMINATIONS, MAY 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)

2021 Admission Only

3F6CADEC

Time: 3 Hours | Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Define Fourier Cosine Series?
2. Write the Legendre Polynomials $P_0(x)$ to $P_5(x)$
3. Define Laplace transform of a function.
4. Write $\mathscr{L}(f''(t))$ in terms of $\mathscr{L}(f(t))$, $f(0)$ and $f'(0)$
5. Explain how to solve a differential equation using Laplace Transforms .
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 value of $\frac{1}{i^6}$.
8. Evaluate $(cos\frac{\pi}{7} + isin\frac{\pi}{7})^7$.
9. Define $coshz$ and $sinhz$.
10. For what contours C will it follows from Cauchy's integral theorem that $\int_C \frac{dz}{z} = 0$.
11. State Cauchy's integral formula.
12. State Morera's Theorem.

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Find the fourier series expansion of the function $f(x) = x, 0 \leq x < \pi$ and $f(x) = 2\pi - x, \pi \leq x < 2\pi$and $f(x + 2\pi) = f(x)$ and deduce that $1 + \frac{1}{3^2} + \frac{1}{5^2} + \ldots. = \frac{\pi^2}{8}$?

14. Find the Fourier Cosine series of $f(x) = \cos 2x, x \in [0, \pi]$

15. Find $\mathscr{L}^{-1}\{\frac{3}{s^3+s}\}$ using integration method.

16. Find $\mathscr{L}\{\sin at\}$ and hence by differentiation evauate $\mathscr{L}\{t^2 \sin at\}$

17. Solve the equation $z^4 + 4 = 0$.

18. Check the analyticity of $\frac{i}{z^5}$.

19. Prove that $|sinz|^2 = sin^2x + sinh^2y$.

20. Find the parametric representation of the following curves

    a) |z-i| = 2

    b) |z - 3 + 4i| = 4

21. Evaluate $\oint_C \frac{e^z}{(z-1)^2(z^2+4)} dz$, C is the circle |z| = 3/2.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Apply power series method to find the solution of the following differential equations

    a)$y' = 2xy$

    b) $y'' + 9y = 0$

23. Find (a) $\mathscr{L}^{-1}(\frac{4s+1}{s^2-16})$

    (b)$\mathscr{L}^{-1}\{\frac{4}{(s+1)(s+2)}\}$

24. Check whether the function $u = x^2 + y^2$ is harmonic or not. If YES, find a corresponding analytic function $f(z)$.

25. Integrate f(z) = Re z along

    a) the line segment from z=0 to z = 1+i.

    b) the real axis from 0 to 1 and then along a straight line parallel to the imaginary axis from 1 to 1+i.

(2×15=30)