QP CODE: 20100830

20100830

Reg No : ....

Name : ....

B.Sc DEGREE (CBCS) EXAMINATION, MARCH 2020

Fourth Semester

Complemetary 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 Electronics and Computer Maintenance Model III, B.Sc Food Science & Quality Control 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 Chemistry Model III Petrochemicals, B.Sc Physics Model III Electronic Equipment Maintenance, B.Sc Geology and Water Management Model III)

2017 Admission onwards

06390BD0

Time: 3 Hours | Marks: 80

Part A

*Answer any **ten** questions.*

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

1. Define the fourier Sine series?
2. What is the general expression for the Legendre polynomial $P_n(x)$ of degree n?
3. Find the $\mathscr{L}^{-1}(\frac{1}{s^2+25})$
4. Write a relation between $\mathscr{L}\{\int_0^t f(t)dt\}$ and $\mathscr{L}\{f(t)\}$
5. Write $\mathscr{L}\{\frac{f(t)}{t}\}$ in terms of an integral.
6. Find the real and imaginary parts of $\frac{z_1}{z_2}$, where $z_1 = 2+3i$ and $z_2 = 1+i.$
7. Find the value of i^{101}.
8. Write the De Moivre's formula.
9. Evaluate i^{2i}.
10. Find the parametric representation z = z(t) of the line segment with end points z =0 and z =1+2i.
11. State true or false: If a complex function f is analytic at a point, then its derivatives of all orders are also analytic at that point.
12. State Cauchy's inequality.

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Find the Fourier series expansion of $f(x) = \begin{cases} \frac{\pi}{2} + x & -\pi < x < 0 \\ \frac{\pi}{2} - x & 0 < x < \pi \end{cases}$ with $f(x+2\pi) = f(x)$
14. Solve the differential equation $y' - y = 0$ by power series method
15. Get a reduction formula for $\mathscr{L}(t^n)$. Hence or otherwise find $\mathscr{L}(t^n)$ when n is a positive integer.
16. Solve $y'' + a^2 y = 0$ with $y(0) = A$ and $y'(0) = B$, using Laplace transforms
17. Solve the equation $z^4 + 4 = 0$.
18. Check the analyticity of $\frac{i}{z^5}$.
19. Find the image of the vertical line $x = x_o$ in the complex plane under the mapping e^z.
20. Evaluate $\int_C \bar{z} dz$, where C is the right hand half of the circle |z| = 2 from z = -2i to z = 2i.
21. Evaluate $\oint_C \frac{z^2-1}{z^2+1} dz$ using Cauchy's integral formula, C is the circle |z| = 1/2.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Find the Fourier series expansion of $f(x) = e^x, x \in [0, 2\pi]$ where the function is of period 2π
23. Evaluate $\mathscr{L}(t \cos at)$ and $\mathscr{L}(t \sin at)$ by differentiation method
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. Verify Cauchy's integral theorem for the integral of e^z taken over the boundary of the triangle with vertices (0,0),(2,0) and (0,2) in the counter clockwise direction.

(2×15=30)