LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FOURTH SEMESTER – APRIL 2010

PH 4504/PH 4502/PH 6604 - MATHEMATICAL PHYSICS

Date & Time: 21/04/2010 / 9:00 - 12:00 Dept. No. Max. : 100 Marks

PART - A

Answer **ALL** the questions (10 x 2 =20 marks)

1. Show that the complex variable $f(x) = |z|^2$ is differentiable only at the origin.
2. Define logarithm of a complex variable.
3. Find the value of $_c\int (x + y)\, dx + x^2y\, dy$ along $y= x^2$ having (0, 0), (3, 9) end points.
4. The complex integral $_c\int \tan (2\pi z)\, dz$, where c is the closed curve $|z| =1$ is _____.
5. Write down the equation of two dimensional heat flow at steady state.
6. Solve the wave equation $\partial^2u / \partial t^2 = C^2 (\partial^2u / \partial x^2)$ under the conditions u = 0 when x = 0 and x = π.
7. Write down Parseval's formula.
8. Express f(x) = x as a sine series in the interval 0 < x < π.
9. Find the missing yx values from the first differences provided

y_x	0	1	3	7	-	-
Δy_x	0	1	2	4	7	11

10. Write down Simpson's one third rule.

PART - B

Answer any **FOUR** questions (4 x 7.5 = 30 marks)

11. Find the general value of log(1 + i) + log (1 – i)
12. Find the value of $_c\int (z + 4) / (z^2 + 2z + 5)\, dz$, if c is a circle $| z + 1 | = 1$.
13. Find the solution of the wave function $\partial^2y / \partial t^2 = C^2 (\partial^2y / \partial x^2)$. Given that y(x,θ) = 0 for x=0 and if (x,θ) = v for x=0.
14. Find the Fourier series representing f (x) = x , 0<x < 2π and sketch its graph from x = -4 π to x = 4π.
15. Find the value of x when y = 85, using Lagrange's formula from the following table

x	2	5	8	14
y	94.8	87.9	81.3	68.7

(P.T.O.)

PART - C

Answer any **Four** questions (4 x 12.5 = 50 marks)

16. State and explain the theorem for a function f(x) to be analytic and also derive the sufficient condition for the function to be analytic.
17. Find the value of the integral $_0\int^{1+i} (x - y + ix^2)\, dz$
    a) along the straight line from z = 0 to z =1+ i
    b) along real axis from z = 0 to z = 1 and then along a line parallel to the imaginary axis from z = 1 to z = 1 +i.
18. A tightly stretched string with fixed end points at x =0 and x =l is initially in a position given by $y = y_0 \sin 3 (\Delta x / i)$ .If it is released from rest from this position ,find the displacement y(x,t) .
19. a) Derive the Fourier coefficients.
    b) Obtain the complex form of the Fourier series of the function
    $f(x) = 0 \quad -\pi <= x < = 0$
    $\quad = 1 \quad 0 <= x < = \pi$
20. Derive Newton's interpolation formula. Derive the Trapezoidal and Simpson's rule.

$$$$$$$