

# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



**B.Sc.DEGREE EXAMINATION –PHYSICS**

**THIRD SEMESTER – NOVEMBER 2017**

**16UPH3MC01– MATHEMATICAL PHYSICS**

Date: 04-11-2017

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

## PART- A

**Answer all Questions**

**(10×2=20 marks)**

1. If  $z_1 = a - i$  and  $z_2 = a + i$  find  $z_1^* z_2$  for any real 'a'.
2. State the conditions for a function to be analytic.
3. Find grad  $\phi$  if  $\phi = x^2 y^3$ .
4. Give two examples of vector point function.
5. What do you mean by orthogonality of trigonometric system?
6. What are odd and even functions?
7. Write the heat flow equation.
8. Obtain the differential equation of vibrating string.
9. Write Lagrange's interpolation formula
10. Write down trapezoidal rule for integration.

## PART –B

**Answer any FOUR Questions**

**(4×7.5=30 marks)**

11. Derive Cauchy Riemann conditions for a function to be analytic in a given region.
12. If  $\vec{u} = yz\vec{i} + zx\vec{j} + xy\vec{k}$  and  $f = xyz$  find curl ( $f\vec{u}$ ).
13. Find the Fourier series of the equation

$$F(x) = \begin{cases} 0, & \text{if } -2 < x < -1 \\ k, & \text{if } -1 < x < 1 \\ 0, & \text{if } 1 < x < 2 \end{cases}$$

14. Solve the differential equation  $2x \frac{\partial u}{\partial x} - 3y \frac{\partial v}{\partial y} = 0$  by the method of separation of variable.
15. Using Simpson's 1/3<sup>rd</sup> rule, Evaluate  $\int_0^1 \sqrt{1+x^2} dx$  with ten equal intervals.
16. i) Sketch  $|z - 4i| = 7$   
ii) Evaluate  $\int_c \frac{z}{z^2+1} dz$  where c is  $|z + i| = 1$

## PART –C

**Answer any FOUR Questions**

**(4×12.5=50 marks)**

17. The centre of a regular hexagon is at the origin and one vertex is given as  $\sqrt{3} + i$  in the Argand diagram. Find the complex number represented by other vertices.
18. Verify Green's theorem in a plane for  $\int_c (x^2 + 2xy) dx + (y^3 + x^3y) dy$  where c is a square with the vertices P(0,0);Q(1,0);R(1,1); S(0,1).

19. Find the even and odd periodic half range expansions of the function.

$$F(x) = \begin{cases} \frac{2}{L}x & \text{if } 0 < x < \frac{L}{2} \\ \frac{2}{L}(L-x) & \text{if } \frac{L}{2} < x < L \end{cases}$$

20. Write Laplace equation in cylindrical coordinates and derive its general solution.

21. Derive Newton's forward interpolation formula and using it find the value of y at x=0.23 from the following table.

X	0.20	0.22	0.24	0.26	0.28	0.30
Y	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

22. Find the Fourier cosine and sine integral of  $f(x) = e^{-kx}$  where  $x > 0, k > 0$ .

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