LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION –**PHYSICS**

THIRD SEMESTER – **APRIL 2018**

16UPH3MC01– MATHEMATICAL PHYSICS

Date: 03-05-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART- A

Answer ALL questions: (10 X 2 =20 marks)

1. Express $\frac{2-3i}{4-i}$ in the form of a+ib.
2. Verify that f (z) = x^2-y^2+2ixy is analytic.
3. Define scalar point function.
4. Find m so that the vectors $2\hat{\imath} - 4\hat{\jmath} + 5\hat{k}$; $\hat{\imath} - m\hat{\jmath} + \hat{k}$ and $3\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ are co-planar.
5. What do you mean by orthogonality of trigonometric system?
6. What is the fundamental period of $y = \sin x$?
7. Distinguish between ordinary and partial differential equation
8. Write down a homogenous first order partial differential equation in two variables.
9. Using Trapezoidal rule, evaluate $\int_0^2 ydx$ from the following data

X	0	0.5	1	1.5	2
Y	1.000	0.800	0.500	0.308	0.200

10. Given $\frac{dy}{dx}$ = -y with y = 1 at x = 0 find y (0.02) using Euler's method.

PART- B

Answer any FOUR questions: (4 X 7.5 =30 marks)

11. Derive Cauchy – Riemann equation.
12. A vector field is given by $\bar{A}$ = (x^2+xy^2) $\hat{\imath}$ + (y^2+ x^2y) $\hat{\jmath}$ show that the field is irrotational and find the scalar potential.
13. Determine the Fourier series of the function on f(x) = x+π if – π < x < π with a period of 2 π.
14. Obtain the solution of the wave equation $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$ using the method of separation of variables
15. Obtain the Lagrange's interpolation polynomial of degree two for the following data:

    (x,y): (0,0) , (1,3) , (2,9)
16. Use Green's theorem to evaluate $\int_C x^2 y\,dx + x^2 dy$ where, c is the boundary described counterclockwise of the triangle with vertices (0,0);(1,0);(1,1)

PART – C

Answer any FOUR questions: **(4 X 12.5 =50 marks)**

17. a) State and prove Cauchy's integral theorem.

    b) Verify the integral theorem for $\oint_c zdz$, where c is a circle of radius 1.

18. Evaluate $\iint r^3 dr d\theta$, over the area bounded between the circles r=2cos θ and r = 4 cos θ.

19. Find the Fourier sine integral for f(x) = $e^{-\beta x}$ (β>0) hence show that $\frac{\pi}{2} e^{-\beta x} = \int_0^\infty \frac{\lambda \sin \lambda x}{\beta^2+\lambda^2} d\lambda$.

20. Write a one dimensional heat equation and derive its general solution.

21. Derive Newton's forward interpolation formula.Use it to 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. Given that $f(x) = x + x^2$ for $-\pi < x < \pi$, find the Fourier series of $f(x)$

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