Reg. No ..... Name **17P3619**

MSc DEGREE END SEMESTER EXAMINATION- OCTOBER-NOVEMBER 2017

SEMESTER 3 : PHYSICS

COURSE : **16P3PHYT10 ; COMPUTATIONAL PHYSICS**

(For Regular - 2016 admission)

Time : Three Hours Max. Marks: 75

Section A

Answer any 5 (1 marks each)

1. A polynomial of degree _____ can be formed if 'n' pairs of arguments and entries are given.
   (a) n (b) n-1
   (c) n+1 (d) of any order
2. Using Newton's forward interpolation formula obtain the value of y(1.6) if

x:	1	1.4	1.8	2.2
y:	3.49	4.82	5.96	6.5

   (a) 5.54 (b) 5.45
   (c) 5.35 (d) None of the above
3. Trapezoidal and Simpson's rules can be used to evaluate
   (a) Double integrals (b) Differentiation
   (c) Multiple Integrals (d) Divided difference
4. What type of Eigen value is obtained using power method.
   (a) Largest eigen value (b) Smallest eigen value
   (c) Eigen vector (d) Characteristic equation
5. The partial equation $xu_{xx} + u_{yy}$ =0 is a parabolic if x is
   (a) > 0 (b) < 0
   (c) $= 0$ (d) none of the above

5 x 1 (5)

Section B

Answer any 7 (2 marks each)

6. Discuss least square method for fitting a straight line.
7. Discuss least square method for fitting a power curve.
8. Talk on the intervals spacing required to carry out Trapezoidal, Simpsons 1/3 and Simpsons 3/8 formula.
9. What are the advantages of Monte Carlo integration over the other usual Numerical integration schemes.
10. Discuss truncation and rounding off errors in Numerical differentiation.

11. What is a pivoting element?
12. Differentiate between direct and iterative methods of solving numerical problems. Give examples of each.
13. Write down a linear second order PDE of the general form and mention the case when it reduces to an parabolic equation
14. Write down the diffusion equation and represent the same in a finite difference representation.
15. Comment on the statement with valid reason: Standard five point formula is preferred over diagonal five point formula in solving Laplace equation.

7 x 2 (14)

Section C
Answer any 4 (5 marks each)

16. Use linear interpolation method to calculate the square root of 4.5 from following table.
    Take two initial values as 4 and 5

x :	1	2	3	4	5	6
f(x):	1	1.4142	1.7321	2	2.2361	2.4494

17. Compute **f(0.3)** for the data

x	0	1	3	4	7
f	1	3	49	129	813

18. From the following table find the value of dy/dx at the point x=1.0

X	1	1.1	1.2	1.3	1.4	1.5
Y	5.4680	5.6665	5.9264	6.2551	6.6601	7.1488

19. Given the equation: dy/dx = 2y/x with y(0)=2. Estimate y(2) using Heun's Method / 2nd order RK method at h = 0.25.
20. Write down the finite difference analogue of the Laplace equation in 2 dimension and arrive at the diagonal five point formula
21. Obtain the tridiagonal matrix obtained while trying to solve the diffusion equation explicitly.

4 x 5 (20)

Section D
Answer any 3 (12 marks each)

22. Derive the formula for the leading error in the Newton's backward differences interpolation formula.
23. Discuss Simpson's 1/3 method and error associated with it.
24. Discuss Romberg's Integration method.
25. Discuss power method and write an algorithm for the same.
26. Discuss Jacobi method to solve Eigen value problem.

27. Discuss finite differences approximations of derivatives in solving Diffusion equation of one state variable. **3 x 12 (36)**