Reg. No ..... Name **18P3619**

MSc DEGREE END SEMESTER EXAMINATION - OCTOBER 2018

SEMESTER 3 : PHYSICS

COURSE : **16P3PHYT10 : COMPUTATIONAL PHYSICS**

(For Regular - 2017 Admission & Supplementary - 2016 Admission)

Time : Three Hours Max. Marks: 75

Section A
Answer any 5 (1 marks each)

1. For operators E and μ
   a) E^2 μ=1/ μ b) Eμ= 1/E c)E μ= μE d)E μ=1
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. Three point Gaussian Quadrature formula is exact for polynomials up to degree
   (a) 1 (b) 4 (c) 3 (d) 5
4. From the following which one gives the more accurate value
   (a) Modified Euler's method (b) Euler's method.
   (c) Both (a) and (b) (d) R-K method
5. An example of elliptical PDE is
   (a) Laplace equation (b) heat equation (c) wave equation (d) none of these

(1 x 5 = 5)

Section B
Answer any 7 (2 marks each)

6. Show that the following relation for operators holds good:
   μ≡ sqrt(1 + δ^2/4)
7. Find the missing value of f(x=4) in the following data:

x	1	2	3	4	5	6	7
f(x)	2	4	4	?	32	64	128

8. Write down the expression for an 1 D integration in terms of Monte Carlo method.
9. What are the advantages of Monte Carlo integration over the other usual Numerical integration schemes.
10. Graphically explain trapezoidal rule of integration
11. What is a pivoting element?
12. Graphically explain what happens in modified Euler method way of solving ODE.
13. Write down a linear second order PDE of the general form and mention the case when it reduces to an parabolic equation
14. Discuss the type of stability conditions involved in explicit way of solving PDE

15. Write a note on weighted average implicit method.

(2 x 7 = 14)

Section C
Answer any 4 (5 marks each)

16. Find the cubic polynomial which takes the following values:
y(0) = 1, y(1) = 0, y(2)=1 and y(3)=10. And hence obtain the value of y(4)

17. Using Newton's forward difference formula find the sum $S_n = 1^3+2^3+3^3+....n^3$

18. Write down an algorithm to carry out Trapezoidal rule of integration.

19. Given dy/dx = $x^2 + y^2$, y(0) =0 using 4th order RK method, estimate y(0.4), take h = 0.2

20. Write down the finite difference analogue of the Laplace equation in 2 dimension and arrive at the standard five point formula.

21. Given the differential equation $u_t = u_{xx}$ and the boundary conditions u(0,t)=u(5,t)=0 and u(x,0)=$25x^2 - x^4$, use the explicit method to obtain the solutions for
x_i=ih, h=1, i=0,1,2,...5
and
t_j=jk, k=1/2, j=0,1,2,...5

(5 x 4 = 20)

Section D
Answer any 3 (12 marks each)

22.1. Derive Newton's divided difference formula. Write down the expression for the leading error term observed in this formula.
OR

2. Discuss Simpson's 3/8 method and error associated with it.

23.1. Integrate the function f(x)= 1/x using Romberg's method starting with trapezoidal rule taking h=1,0.5,0.25 and 0.125. Take limits of integration 1 and 2.
OR

2. Discuss any 2 PC methods.

24.1. Discuss 2 methods to obtain the inverse of a matrix.
OR

2. Obtain the leading error term involved with standard five point formula in solving Laplace equation.

(12 x 3 = 36)