Reg. No.....Name.....

M.SC DEGREE END SEMESTER EXAMINATION OCTOBER 2016

SEMESTER – 3: PHYSICS

COURSE: P3PHYT10 – COMPUTATIONAL PHYSICS

Common for Regular (2015 Admission) & Supplementary / Improvement (2014 Admission)

Time: Three Hours Max. Marks: 75

PART A (Objective)

(Answer **all** questions. Each question carries 1 Mark)

1. .....Interpolation formula can be used whether the values of x are equally spaced or not
   (a) Newtons forward (b) Newtons backward (c) Newtons central difference (d) Lagrange's
2. If all the points of observations lie on the curve ,then by least square method E will be
   (a) Zero (b) positive (c) negative (d) all of these
3. The error in Simpsons 1/3 rule is---
   (a) 3/80 $h^5y^7(x)$ (b) b-a/80 h^4 y^4 (c) $4h^7/98$ $h^4y^3(x)$ (d) – (b-a)/180 h^4 y^4 ($\vec{X}$)
4. "Multi step method "is also known as -----
   (a) Predictor corrector method (b) R-K method (c) Milnes method (d) Eulers method
5. A method in which the computation of many present unknown values necessitates the solution of a set of simultaneous equations is called --
   (a) Explicit method (b) implicit method (c) real method (d)direct method

(1 x 5 = 5)

Part B (Short Answer)

(Answer **any five** question. Each question carries 2 mark)

6. Show that the operations μ and E commute
7. What is Ψ^2 test
8. What is double integration
9. What are the errors associated numerical differentiation
10. Derive the Schmidt explicit formula from diffusion equation
11. Explain the geometrical significance of trapezoidal rule
12. Derive second order Runga-kutta formula from modified Euler method
13. Evaluate $I=\int_0^1 \frac{1}{1+X}$ dx using Simpsons 1/3 rule take h=1/6

(2 x 5 = 10)

PART C (Problem/Short Essay)

(Answer **any three** questions. Each question carries 4 Marks)

14. Use Gauss elimination to solve 2x+y+z=10,3x+2y+3z=18,x+4y+9z=16

15. Evaluate f(3) using interpolating polynomial

X	:	1	2	5
f(x)	:	1	4	10

16. By the method of least squares fit a curve of the form $y=a+bx+cx^2$ to the following data:

x :	0.0	0.5	1.0
y :	1.0000	1.6487	2.7183

17. Determine the largest Eigen value of the matrix and corresponding Eigen vector of the matrix $\begin{matrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{matrix}$

18. Find y(2.0) if y(t) is the solution of $\frac{dy}{dt}=\frac{1}{2}$ (t+y) ,y(0)=2, y(0.5)=2.636, y(1.0)=3.595 and y(1.5) = 4.968 using Milnes method.

(4 x 3 = 12)

Part D (Essay)

(Answer **all** question, 12 marks each)

19. (a) Tabulate the values of the function $f(x,y)=x^2+y^2-y$,for x=0,1,2,3,4 and y=0,1,2,3,4 using the table of values computer (2.5,3.5) by numerical double interpolation

OR

(b) Obtain the forward and backward difference polynomials from the following data and interpolate at x=0.25 and x=0.35

x	0.1	0.2	0.3	0.4	0.5
f(x)	1.40	1.56	1.76	2.00	2.28

20. (a) Discuss the concept of Romberg's integration and using it find the value of $\int_1^{1.8} y(x)\,dx$

X	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Y	1.543	1.669	1.811	1.971	2.151	2.352	2.577	2.828	3.107

Do the iteration till m=3

(a) Find the approximate value of $y= \int_0^{\pi} \sin x\, dx$ using (i) trapezoidal rule, (ii)Simpsons 1/3 rule by dividing the range of integration into six equal parts .calculate the percentage error from its true value in both the cases

21. (a) Use Runga –kutta method of fourth order to solve numerically the initial value problem

10 $dy/dx = x^2+y^2$, $y(0)= 1$ and find y in the interval $0 \leq x \leq 0.4$.taking $h=0.1$

OR

(b) Use Gauss- Jordan method to compute the inverse of the matrix

$$\begin{matrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{matrix}$$

22. (a) show that $2\Delta x(\partial T/\partial x)_{I,j} = 3T_{i,j} - 4T_{i-1,j} + T_{i-2,j}$ using the basic concept in finite difference methods

OR

(b) Explain Crank Nicolson method and weighted average implicit method in detail (12 x 4 = 48)

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