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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCE**

 **APRIL/MAY, 2019 EXAMINATIONS**

**COURSE CODE: PHY 314**

**COURSE TITLE: NUMERICAL COMPUTATIONS**

**CREDIT UNIT 2**

**TIME ALLOWED (2 HRS)**

**INSTRUCTION: *Answer question 1 and any other three questions***

**QUESTION 1**

Q1.a. (i) State the rules for rounding off a number to *n* significant figures.

(ii) What is arithmetic precision?

6 marks

b. Round the following numbers to 5 significant figures:

1. 3.142857143 2 marks
2. 6.32431925 2 marks
3. 1.4123519 2 marks

c. A student obtained the following reading with a mirror in the laboratory.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **U** | 10 | 20 | 30 | 40 | 50 |
| **v** | -7 | -10 | -14 | -15 | -17 |

1. Linearise the relationship 1/v = 1/f – 1/u. 3 marks
2. Plot a graph of v-1 against u-1 and draw the line of best fit.

d (i) List five(5) operators. 5 marks

1. With the aid of the Euler method, calculate *y*(0.8) , given the differential equation

$\frac{dy}{dx}=x+y;y\left(0\right)=0$; with h = 0.2**.** 5 marks

**QUESTION 2**

 With a step length of 0.1, find the value of *y* at *x* = 0.2 given the ordinary

differential equation:$ \frac{dy}{dx}=-y+x=0;y\left(0\right)=0$ using;

(a) Second-order Runge-Kutta method 4 marks

(b) Fourth-order Runge-Kutta method. 6 marks

(c) Give four (4) methods of solving first order ordinary differential equations. 2 marks

(d) Write the modified Euler method formula. 3 marks

**QUESTION 3**

 (a) What are strings? 4 marks

 (b) Give the three (3) categories of constants. 3 marks

 (c) Differentiate between increase and decrease operators. 3 marks

 (d) Briefly discuss on conditional structure. 5 marks

**QUESTION 4**

 (a) Write short note on functions. 3 mark

 (b) Briefly Explain Arrays. 4 marks

 (c) Differentiates between basic input and basic output statements. 4 marks

 (d) Write the Taylor’s series formula. 4 marks

**QUESTION 5**

 a) A student performing the simple pendulum experiment obtained the following

results, where *t* is the time for 50 oscillations. 6 marks

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| l(cm) | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 1571 |
| t(s) | 71 | 69 | 65 | 61 | 56 | 52 | 48 | 43 |

Find the acceleration due to gravity at the location of the experiment, using

(a) The method of least squares, and

(b) The method of group averages. 3 marks

(c) Solve the system of linear equations *x* + 2*y* + 2*z* = -2 , 2*x* + 2*y* + *z* = -4 ,

9*x* + 6*y* + 2*z* = -14 using the method of

(i) Gaussian elimination 3 marks

(ii) Gauss-Jordan elimination 3 marks