



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:

- | | | |
|-------|-------------|---------|
| (i) | 3.142857143 | 2 marks |
| (ii) | 6.32431925 | 2 marks |
| (iii) | 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

- | | | |
|------|--|---------|
| (i) | Linearise the relationship $1/v = 1/f - 1/u$. | 3 marks |
| (ii) | Plot a graph of v^{-1} against u^{-1} and draw the line of best fit. | |

- | | | |
|-------|--|---------|
| d (i) | List five(5) operators. | 5 marks |
| ii. | With the aid of the Euler method, calculate $y(0.8)$, given the differential equation $\frac{dy}{dx} = x + y$; $y(0) = 0$; 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: $\frac{dy}{dx} = -y + x = 0$; $y(0) = 0$ 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 $x + 2y + 2z = -2$, $2x + 2y + z = -4$, $9x + 6y + 2z = -14$ using the method of
 - (i) Gaussian elimination 3 marks
 - (ii) Gauss-Jordan elimination 3 marks