NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES

DEPARTMENT OF PURE AND APPLIED SCIENCE

2020_2 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

(a) Differentiate between exact numbers and approximate numbers. **(4 marks)**

(b). List three effective rules that are used to recognize and handling significant digits **(3 marks)**

(c). An approximate value of π is given by $x_1 = 22/7 = 3.1428571$ and its true value is $x = 3.1415926$. Find **(i)** the absolute error and **(ii)** the relative error **(4 marks)**

(d). Assume a given table of values (x_i, y_i), $i = 0, 1, 2 \ldots\ldots n$ for a given function $y = f(x)$, briefly discuss the three types of finite differences known and state their individual first difference operator. **(6 marks)**

(e). Mention four methods of solving a first order ordinary differential equation. **(4 marks)**

(f). List four types of operator that are usually employed in C++ programming**(4 marks)**

QUESTION 2

(a). Define arithmetic precision **(2 marks)**

(b) (i) List four types of errors encountered in numerical computations **(4 marks)**

(ii) Discuss any three of them **(9 marks)**

QUESTION 3

(a). Find the difference $\sqrt{6.37} - \sqrt{6.36}$ to three significant figures **(3 marks)**.

(b). What is interpolation? **(2 marks)**

(c). (i) Find the absolute and relative errors when the exact answer and the computed answer in an experiment are respectively $A = 20.138$ and $\bar{A} = 20.125$. **(4 marks)**

(ii) Show that the Shift operator is given as $E = 1 + \Delta$ **(6 marks)**.

QUESTION 4

(a). If $y = a(3)^x + b(-2)^x$ and $h = 1$, prove that $(\Delta^2 + \Delta - 6)y = 0$ **(10 marks)**

(b). Using the Trapezoidal rule, find from the table below, the area bounded by the curve and the x-axis from x = 7.47 to x = 7.52 **(5 marks)**

x	***f(x)***
7.47	1.93
7.48	1.95
7.49	1.98
7.50	2.01
7.51	2.03
7.52	2.06

QUESTION 5

(a). Find the missing y_x values from the first differences provided: **(11 marks)**

y_x	0	-	-	-	-	-
Δy_x	0	1	2	4	7	11

(b). Consider the first order differential equation $\frac{dy}{dx} = f(x, y)$ with initial boundary conditions $y(x_0) = y_0$, differentiate between initial value problems andboundary value problems. **(4 marks)**