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

DEPARTMENT OF PURE AND APPLIED SCIENCE

2021_1 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) Round-off the following number

i.12.0234831 4 s.f

ii. 295.10542 5s.f

iii. 0.0045829 3s.f **(3marks)**

(b) A student obtained the following data in the laboratory by making use of the method of the least squares, Find the relationship between x and t

x	5	12	19	26	33
T	23	28	32	38	41

(3 **marks)**

(c) Solve the system of equation using Gaussian elimination method

$2x_1 + 3x_2 = 13$

$x_1 - x_2 = -1$ **(4 marks)**

(d) Give two demerits of bisection and Newton-Raphson **(4marks)**

(e) Show that $\nabla^3 y_2 = \nabla^3 y_5$ **(3marks)**

(f) Write out the Simpson's three-eight and Simpson's one-third rule **(3marks)**

(g) using the Euler method, calculation y (0.8), given the differential equation

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

QUESTION 2

(a) Mention and explain two different types of errors. **(4marks)**

(b) An approximation to the value of π is given by $\frac{22}{7}$, while its time in 8 decimal digits is 3.1415926. Calculate the

i. the absolute error **(3marks)**

ii. Relative error **(4marks)**

iii. Percentage error in the approximation **(4marks)**

QUESTION 3

Solve the following system of linear equations corrects up to three decimal places using the Gauss-seidal iterative procedure. Take Zero vector as the initial solution error

$$3x_1 + x_2 - 2x_3 = 3$$

$$2x_1 + 4x_2 + x_3 = 7$$

$$x_1 - x_2 + 4x_3 = 4$$

Show that at the fifth iteration; the solution is correct to 3decimal places. The exact solution for the system is $x_1 = 1$, $x_2 = 1$,$x_3 = 1$ **(15marks)**

QUESTION 4

Find the cubic polynomial that fits the table below

X	1	2	3	4
Y	3	9	27	63

(15marks)

QUESTION 5

(a) Use Picard method to solve the initial value problem

$$\frac{dy}{dx} = -2xy \, , y(0) = 1$$ **(7marks)**

(b) Use Runger-kutta fourth order method with the step size h=0.1 for the initial value problem $\frac{dy}{dx} = x + y^2 \, , y(1) = 2$ Compute y(1.1) **(8marks)**