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

DEPARTMENT OF PURE AND APPLIED SCIENCE

2021_2 EXAMINATIONS

COURSE CODE:	**PHY314**
COURSE TITLE:	**NUMERICAL COMPUTATIONS**
CREDIT UNIT:	**2**
TIME ALLOWED:	**(2 HRS)**

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

QUESTION 1

a. Solve the ordinary differential equation using the Runge-kutta fourth order method

$\frac{dy}{dx} = y + x; y(0) = 1; find\ y\ at\ x = 0.2$ (**5marks**)

b. Compute the value of integral

$$\int e^{-x^2} dx$$

with the use of Trapezoidal and Simpson rule (**4marks**)

c. Write out the Newton forward and backward interpolation formula (**3marks**)

d. Give two merits of Bisection and Newton-Raphson method (**4marks**)

e. Use Gauss- elimination to compute the solution of the linear system

$x_1 + x_2 + 2x_3 = 5$

$3x_1 + 2x_2 + x_3 = 8$

$x_1 - 2x_2 + 3x_3 = 0$ (**3marks**)

f. Using method of group averages, find the relationship between X and T (**3marks**)

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

g. A student measured the length of a string of actual length 72.5cm. Calculate the absolute error and the percentage error. (**3marks**)

QUESTION 2

a. solve the system of Linear equations

$$x_1 + x_2 + x_3 - 1$$
$$x_1 + 2x_2 + 2x_3 = -4$$
$$9x_1 - 6x_2 + x_3 = 7$$

Using the method:

i.	Gaussian elimination	**(5marks)**
ii.	Gauss-jordan elimination	**(5marks)**
iii.	Lil decomposition	**(5marks)**

QUESTION 3

Solve the following system of linear equation using Jacobi iteration procedure

$$3x_1 + x_2 - x_3 = 3$$
$$2x_1 + 4x_2 + x_3 = 7$$
$$x_1 - x_2 + 4x_3 = 4$$

Consider the initial approximation $x_1^{(0)} = 0$, $x_2^{(0)} = 0$,$x_3^{(0)} = 0$. Apply Jacobi method till the last two consecutive iteration have difference less than 0.0005. **(15marks)**

QUESTION 4

Evaluate the integral $\int_1^{2.2} \frac{1}{1+2x+x^2} dx$ by trapezoidal and Simpson rules by dividing the interval into 12 eqaul subinterval. Use six decimal places round-off arithmetic. **(15marks)**

QUESTION 5

The current flowing in a particular R.C circuit is tabulated against the change in the time t- t_0, the current is 1.2A. Using method of least-square and group averages. Find the slope and the intercept of the linear function relating the current I to the time t, hence determine the time-constant of the circuit. **(15marks)**