NATIONAL OPEN UNVERSITY OF NIGERIA
JABI, ABUJA
FACULTY OF SCIENCE
SEPTEMBER/OCTOBER 2016 EXAMINATION

COURSE CODE: PHY314
COURSE TITLE: NUMERICAL COMPUTATION
TIME: 2 Hours 30 Minutes
INSTRUCTION: Answer any four questions.

1. (a) Solve the system of linear equations
$x + y + z = -1,\ x + 2y + 2z = -4,\ 9x + 6y + z = 7$
using the method of (a) Gaussian elimination
(b) Solve the following system of equations using the method of LU decomposition.

$2x + y - z = 5$
$x + 3y + 2z = 5$
$3x - 2y - 4z = 3$

2(a) Find a zero of the function $f(x) = 2x^3 - 3x^2 - 2x + 3$ between the points 1.4 and 1.7, using the bisection method. Take the tolerance to be $|x_{j+1} - x_j| \leq 10^{-5}$.

3.(a) A student obtained the following data in the laboratory.

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

By making use of the method of least squares, find the relationship between x and t.
(b) Solve the problem in 1(a) using the method of group averages and compare the results obtained by the two methods.

4.(a) Find the zeros of the function $f(x) = 2x^3 - 3x^2 - 2x + 3$ using the Newton-Raphson method, starting with $x = 1.4$. Take the tolerance to be $|x_{j+1} - x_j| \leq 10^{-5}$.
(b) Find the root of the equation $f(x) = 2x^3 - 3x^2 - 2x + 3$ between x = 1.4 and 1.7 by the regula-falsi method.

5.(a) Find the wrong entry in the following table, given that they represent a cubic polynomial.

x	0	1	2	3	4	5	6	7	8
y	-2	4	34	106	238	448	754	1174	1726

(b) Find the cubic polynomial that fits the following table.

x	1	2	3	4
y	3	9	27	63

6..(a) Carry out the forward, backward, and the central difference schemes on the set of data provided below:

1	2	3	4	5	6	7
1	12	47	118	237	416	667

(b) Starting with the function $8x^3 - 8x^2 - 2x - 12$, draw up a difference table.
Deduce the equation that fits the data, starting from the table alone.

7.(a) Integrate the function $x(t) = \frac{1}{2}t^2 + \frac{5}{2}t + 2,\ 0 \le t \le 0.6$, with six intervals, using the Simpson's one-third rule

(b) With the aid of the Euler method, calculate $y(0.8)$, given the differential equation

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