



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-eighth and Simpson's one-third rule

(3marks)

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

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

(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 true value 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

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

(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)