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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCES**

**JULY 2018 EXAMINATIONS**

**COURSE CODE: PHY 314**

**COURSE TITLE: NUMERICAL COMPUTATIONS**

**CREDIT UNIT: 2**

**TIME ALLOWED (2 HRS)**

**INSTRUCTION: *Answer question one (1) and any other three (3) questions***

**QUESTION 1**

1. a) Define the following terms (i) Rounding errors [2 marks]

 (ii) Inherent errors [2 marks]

 (iii) Truncation errors [2 marks]

b) Integrate the function $f\left(x\right)=x^{2}+3x+1$ with respect to $x$, $0\leq x\leq 3$ and step size

 = 0.5, using the (i) Trapezoidal rule [6 marks]

 (ii) Simpson’s one-third rule [6 marks]

 and (iii) Simpson’s three-eighth rule. Compare your results with the exact integral.

 [7 marks]

**QUESTION 2**

2. a) Distinguish between the following terms (i) Absolute errors [2 marks]

 (ii) Relative errors [2 marks]

 (iii) Percentage errors [2 marks]

b) A student obtained the following data in the laboratory. By making use of the method of least squares, find the relationship between $x $and $t$.

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

 [9 marks]

**QUESTION 3**

3. a) A carpenter measured the length of a wood of actual length $25.76cm $as $26.84cm$.

 Calculate (i) the absolute error [2 marks]

 (ii) the relative error [2 marks] and (iii) the percentage error [3 marks]

b) Solve the following ordinary differential equation

$$\frac{dy}{dx}=y+x, y\left(0\right)=1$$

using the Runge-Kutta Fourth order method. Find $y$ at $x=0.2$ [8 marks]

**QUESTION 4**

4. a) Using the method of group averages, derive the equations for quantities $m $and $c$.

 [8 marks]

b) The following data was generated from the laboratory. Use the method of group averages to find the relationship between $y $and $x$.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| $$x$$ | 5 | 12 | 19 | 26 | 33 |
| $$y$$ | 23 | 28 | 32 | 38 | 41 |

 [7 marks]

**QUESTION 5**

5. a) Give the general set of a simultaneous linear equations and its matrix representation.

 [6 marks]

b) By Gaussian elimination, obtain the solution set of the system of linear equations

$$\begin{matrix}2x+y-z=5\\x+3y+2z=5\\3x-2y-4z=3\end{matrix}$$

[9 marks]