UNIVERSITY OF CAPE COAST
COLLEGE OF AGRICULTURE AND NATURAL SCIENCES
SCHOOL OF PHYSICAL SCIENCES

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
END OF SEMESTER EXAMINATION (2022/2023 ACADEMIC YEAR)
CSC 402: NUMERICAL ANALYSIS
DURATION: 2 HOURS

TOTAL MARKS: 60 MARKS

1. The following definitions apply to errors in a calculation: *[10 Marks]*

   The absolute error is defined as:
   $\text{Error}_{abs}$ = (Calculated value) – (True value)

   The relative error is defined as:
   $\text{Error}_{rel}$ = [{(Calculated value) – (True value)} / {True value}]

   The percentage error is defined as
   $\text{Error}_{pct} = \text{Error}_{rel} \times 100$
   Assume the true value for a calculation should be 5.0, but the calculated value is 4.0:
   Calculate the absolute error, relative error and the percentage error.

2. Find by the Newton-Raphson method the real root of *[10 Marks]*
   $3x - \cos x - 1 = 0.$

3. a. Find the eigenvalues and eigenvectors for the matrix *[10 Marks]*

$$\begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & 9 \end{pmatrix}$$

   b. Generate the resultant eigen decomposition for the matrix. *[5 Marks]*

4. If approximate solution of the set of equations,

   $2x+2y-z = 6,$

   $x+y+2z = 8$ and

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

   is given by $x = 2.8$ $y = 1$ and $z = 1.8$. Then, what is the exact solution? *[10 Marks]*

5. Solve the following equations by Gauss Elimination Method. *[15 Marks]*

   $x+4y-z = -5$
   $x+y-6z = -12$
   $3x-y-z = 4$