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**TECHNICAL UNIVERSITY OF KENYA**

**FACULTY OF APPLIED SCIENCES AND TECHNOLOGY**

**SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY**

**END OF SEMESTER EXAMINATION SERIES**

**SECOND SEMESTER EXAMINATIONS 2018/2019**

**THIRD YEAR EXAMINATIONS FOR THE DEGREE OF**

**BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY**

**ECII 3202 NUMERICAL METHODS**

TIME: 2 Hours

**Instructions to candidates:**

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your college number on the answer sheet.

Scientific calculator

This paper consists of 3 printed pages

**Candidates should check the question paper to ascertain that allthe pages are printed as indicated and that no questions are missing.**

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**QUESTION ONE: *THIS QUESTION IS COMPULSORY***(30 MARKS)

* 1. Define Numerical Methods. [2 marks]
  2. List any two limitations of numerical differentiation. [4 marks]

1. Differentiate between;
2. Systematic errors and Blunders errors
3. Interpolation and Extrapolation
4. Convergence and Divergence sequence [6 marks]
5. Express each of the following in terms of the functional values
6. [6 marks]
7. The market research department in a company that manufactures audio CDS collected the price demand data of selected prices of the CDS as given below

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 25 | 100 | 175 | 250 |
|  | 19.50 | 14.25 | 10.00 | 8.25 |

Where is the price at a demand of CDS. Using a linear interpolation polynomial approximate the price when [6 marks]

1. Construct a finite difference table of

Hence deduce whether or not the round off error in your values of, are negligible. [6 marks]

**QUESTION TWO** (20 Marks)

1. Let

Estimate using the following rules with the indicated number of sub-intervals. Find the error bound in the estimation in each case:

1. The Trapezoidal rule,
2. Simpsonrule, [8 marks]
3. A policy is issued at the age of 0 with the following graded scale of death benefits payable at the moment of death

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Age | 0 | 1 | 2 | 3 | 4 | 5 |
| Death benefit | 1000 | 3000 | 5000 | 7000 | 9000 | 11000 |

Approximate the death benefit as a linear polynomial in. Hence approximate the benefit payable if death occurs at the age of 2.5 years. [6 marks]

1. Obtain the solution of the following system using Jacobi iterative method. Carry out the computation to 2 decimal places with 6 iterations. [6 marks]

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**QUESTION THREE** (20marks)

1. Graph the function;

Fromto Hence using the Bisection method in the interval, find the root of the function using six iterations. [8 marks]

1. Find the root of

Using the initial guess of and. Use false position (Regular Falsi) method with five iterations. [6 marks]

1. Given that

Using the intervalfrom to;

1. Find the integral for the first two segments using Simpsons’ rule.
2. Use Simpson rule to obtain the integral for the last three segments. [6 marks]

**QUESTION FOUR** (20marks)

1. Using the Newton-Raphson method, find the only real root of the equation

correct to 4 decimal places. Take the initial guess to be 1.5 [6 marks]

1. A function is unknown but experiment has determined its values as;

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0.0 | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 |
|  | 0.52 | 0.57 | 0.63 | 0.77 | 0.79 | 0.80 | 0.98 | 1.83 | 2.07 |

1. Find the best Simpson rule approximation for
2. Assuming on compute a bound for the magnitude of the error in the approximation. [6 marks]
3. Derive the numerical differentiation formulas;
4. [2 marks]
5. [2 marks]
6. Use the above formulas to evaluate and for the function tabulated below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 0.0 | 0.2 | 0.4 | 0.6 | 0.8 |
|  | 0.2020 | 0.4047 | 0.6248 | 0.8861 | 1.2316 |

[4 marks]

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