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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 COMPUTER TECHNOLOGY**

**BACHELOR OF TECHNOLOGY IN COMMUNICATION AND COMPUTER NETWORKS**

**ECSI 3202/ECCI 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 (compulsory) (30 Marks)**

1. Use the method of bisection to find a solution to correct to 4 significant figures.(5 Marks)
2. Use the iterative formula where to find the square root of 200 correct to 1 decimal place. (4 Marks)
3. Given the equation
4. Verify that the equation as a root which lies between 4 and 5. (3 Marks)
5. Form an iterative formula to solve the equation. (3 Marks)
6. Hence find the root correct to 3 decimal places. (4 Marks)
7. Use Newton-Raphson method to find the solution correct to 3 significant figures starting

withof the equation (5 Marks)

1. Given the table of values

***X f(x)***

***2 14***

***4 88***

***6 274***

***8 620***

***10 1174***

Determine the value of ***f(x)*** at ***x = 5.5*** using the Gregory-Newton forward difference formula. (6 Marks)

**Question Two (20 Marks)**

1. (i) Use the iterative formula starting at to find giving your answers correct to three significant figures. (4 Marks)

(ii) Find in its simplest form, the equation which is solved by this iterative. (3 Marks)

1. Show that the equation has a root between 2 and 3 and that the iterative formula can be used to solve the equation. Taking find the rot correct to 2 decimal places. (13 Marks)

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**Question Three (20 Marks)**

1. Derive the Newton-Raphson formula (7 Marks)
2. Hence obtain a root of the equation near *1.1* correct to 4 decimal places. (13 Marks)

**Question Four (20 Marks)**

1. A function ***f(x)*** is defined by table 1.

Table 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***X*** | ***-6*** | ***-5*** | ***-4*** | ***-3*** | ***-2*** | ***-1*** |
| ***f(x)*** | ***0.0024*** | ***0.0064*** | ***0.0183*** | ***0.0498*** | ***0.1353*** | ***0.3679*** |

Use Newton-Gregory interpolation formula to calculate, correct to 5 decimal places the values of the following:

f(-1.12),

f(-5.36). (12 Marks)

* 1. A polynomial function ***f(x)*** is defined by table 2.

Table 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***X*** | ***0*** | ***0.5*** | ***1*** | ***1.5*** | ***2*** |
| ***f(x)*** | ***2*** | ***1.625*** | ***0*** | ***-3.625*** | ***-10*** |

Use Newton-Gregory backward difference formula to determine the equation of the polynomial. (8 Marks)

**Question Five (20 Marks)**

Find the solution ***y(0.1)*** of the initial vale problem with using

* + 1. Taylor series method of order four. (10 Marks)
    2. Runge-Kutta method of order four. (10 Marks)

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