EE254-2F Exam #4 Spring 2020 Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Instructions:**

Open book, open notes and open reference with the following exceptions:

1. No cell phones.
2. No email or messaging applications.
3. No direct copying from online resources. If online resources are used, they must be identified and documented. Your contribution must be easily identifiable. If in doubt, ask.

I am looking for certain keyword/concepts that demonstrate your understanding of Matlab, programming and numerical methods in general. You have 75 minutes to complete the exam and may only leave the room when you turn in the exam. Write clearly!

Question{01}: Briefly explain in your own words, the following terms and concepts (10):

1. What is your understanding of the purpose/use of numerical root finding techniques?
2. What is your understanding of the difference between bracketed and open root finding techniques?

1. Describe the Incremental Search technique including an explanation of its advantages, disadvantages and how you could accidentally miss a root.
2. How would you use the Incremental Search technique in conjunction with another technique to find a root?
3. In addition to the algorithmic techniques we built in our classes/project, we also saw that Matlab provides several built in tools. Describe the steps in using one of them to identify the x\_root\_actual that we use to calculate our e\_t.

Question{02}: Given the following factored polynomial, using incremental search, complete the table:

|  |  |  |  |
| --- | --- | --- | --- |
| xmin | xmax | xdelta | Roots found |
| 0 | 10 | 1 |  |
| 0 | 10 | .5 |  |
| 0 | 10 | .25 |  |
| 0 | 10 | .125 |  |
| 0 | 10 | .0625 |  |

Explain any unexpected behavior.

Question{03}: Given the following table of functions, xmin = .0, xmax = 2, determine the number of iterations required for the given method to find the root for . Use xmin for the procedures that only need one starting point

|  |  |  |
| --- | --- | --- |
| Function | Method | n |
| Poly from Question{02} | Bisection |  |
| Poly from Question{02} | False Position |  |
| Poly from Question{02} | Simple Fixed-Point Iteration |  |
| Poly from Question{02} | Newton-Raphson |  |
| Poly from Question{02} | Secant |  |

|  |  |  |
| --- | --- | --- |
| Function | Method | n |
| x2 – 1 | Bisection |  |
| x2 – 1 | False Position |  |
| x2 – 1 | Simple Fixed-Point Iteration |  |
| x2 – 1 | Newton-Raphson |  |
| x2 – 1 | Secant |  |

|  |  |  |
| --- | --- | --- |
| Function | Method | n |
| x6 – 1 | Bisection |  |
| x6 – 1 | False Position |  |
| x6 – 1 | Simple Fixed-Point Iteration |  |
| x6 – 1 | Newton-Raphson |  |
| x6 – 1 | Secant |  |

|  |  |  |
| --- | --- | --- |
| Function | Method | n |
|  | Bisection |  |
|  | False Position |  |
|  | Simple Fixed-Point Iteration |  |
|  | Newton-Raphson |  |
|  | Secant |  |

|  |  |  |
| --- | --- | --- |
| Function | Method | n |
|  | Bisection |  |
|  | False Position |  |
|  | Simple Fixed-Point Iteration |  |
|  | Newton-Raphson |  |
|  | Secant |  |

Observations about the behavior?