

ARAB ACADEMY FOR SCIENCE, TECHNOLOGY & MARITIME TRANSPORT

SCHOOL OF ENGINEERING

COMPUTER ENG. DEPARTMENT

NUMERICAL ANALYSIS

CC413

PROBLEM SET 1

DUE DATE: 12/03/2012

- Answer all of the following problems,
- Follow the guidelines shown in the attached page,
- Accuracy is expected and will be rewarded,
- Your answer sheet should reflect what is expected from a professional engineer in form and contents.

1. Compute the absolute and the relative errors in approximations of p by p^* .
 - a. $p = \pi$, $p^* = 22/7$
 - b. $p = p$, $p^* = 3.1416$
 - c. $p = 8!$, $p^* = 39900$
 - d. $p = 9!$, $p^* = (18 p)^{1/2}(9/e)^9$
2. Perform the following computations (i) exactly (ii) using three-digit chopping arithmetic, and (iii) using three-digit rounding arithmetic, and (iv) compute the relative errors in each case.
 - a. $4/5 + 1/3$
 - b. $(1/3 - 3/11) + 3/20$
 - c. $(1/3 + 3/11) - 3/20$
3. Using three-digit rounding arithmetic, perform the following computations. Compute the absolute and relative errors with the exact value determined to at least to five digits.
 - a. $133 + 0.921$
 - b. $(2/9).(9/7)$
 - c. $-10\pi + 6e - 3/62$
4. Use four-digit rounding arithmetic to find the most accurate roots of the following quadratic equations.
 - a. $1.002x^2 - 11.01x + 0.01265 = 0$
 - b. $1.002x^2 + 11.01x + 0.01265 = 0$
5. The fifth Maclaurin polynomial for e^{2x} is given by:
 $P_5(x) = (((((4/15x + 2/3)x + 4/3)x + 2)x + 1)x + 1)x + 1$. Compute $e^{-0.98}$ using this polynomial and four-digit rounding arithmetic. Find the absolute and relative errors
6. Repeat problem 5 by reducing the order of the polynomial by one term.

Hints:

If $p = 0.3000 \times 10^1$, $p^* = 0.3100$, then absolute error (ϵ_{abs}) is $|p - p^*| = 0.1$ and relative error $|p - p^*|/|p| = 0.1/0.3000 \times 10^1 = 0.33333 \times 10^{-1}$

$p = 0.d_1 d_2 \dots d_k d_{k+1} d_{k+2} \times 10^1$, Chopping: $p^*_{ch} = 0.d_1 d_2 \dots d_k \times 10^1$, Rounding: p^*_{round} when $d_{k+1} \geq 5$, we round else we simply chop.

Good Luck!

We all need some! ☺

Student Name: Ahmed Saeb

ID Number: 90000111

Home work number 1

Due Date: 9/22/2010

Course Title: Digital System Design

Course Code: CC317

Page1/1

Guidelines for preparing solutions:

- Begin with a concise and clear statement of the problem
- Indicate clearly the steps of your solution
- List any assumptions you make
- Use carefully drawn and labeled sketches and graphs wherever appropriate to clarify your solution
- If a schematic is involved in the problem, draw a circuit diagram, label components and appropriate signals including polarities, if any.
- All numerical quantities should have their units correctly specified.
- Always look for ways to check your answers. Do they look reasonable? Are the units correct? Is there a way to double check the answer?
- Your solutions should be accurate, well-organized and in general exhibit those characteristics one would expect to find in the calculations of a professional engineer.
- Cross section paper is recommended for engineering calculations
- You should equip yourself with the minimal set of sketching and calculation instruments:

Two plastic triangles

Plastic curve

Compass

A programmable calculator (that you have read its manual and understood its various functions and programmability)

Important:

All home work handed for grading should be bound in a soft cover folder with your name and course number printed clearly on the outside. The folder should be of the type with secure metal fasteners so that there is no way that pages can be lost.