



1/04/2016

DOON UNIVERSITY, DEHRADUN
Mid Semester Examination, Second Semester, 2015-16
Department of Physics, School of Physical Sciences
M.Sc. Physics 2 Years programme
Course: PHC-455: Mathematical and Computational Physics

Time Allowed: 2Hours

Maximum Marks: 30

Note: Attempt All Questions from Sections A,B,C.

SECTION: A

Attempt All Questions.

(Marks: 1.5 X 4 = 6)

1. Write down the types of errors in computation. Explain with the examples.
2. Give examples of subroutines and function calls in a function. Write down their significance in programming.
3. Write down a program to interchange the values of two numbers.
4. Prepare a program to calculate the factorial of an integer using a "do-loop".

SECTION: B

Attempt All Questions.

(Marks: 4 X 3 = 12)

5. Write down a program to sort a list of 5 integers.
6. A particle with mass $m = 2500\text{kg}$ is revolving around another mass $M = 5 \times 10^6\text{kg}$. Write down a program to find out the escape velocity of this system. Then prepare a table of 30 positions of the smaller particle revolving around the heavier particle in a circle with the velocity of half of escape velocity. (The gravitational constant is $6.674 \times 10^{-11}\text{m}^3\text{kg}^{-1}\text{s}^{-2}$. $\pi = 355 / 113$)
7. Find out the root of the equation $5 \sin(x) - 4 = 0$ using Newton Raphson method.

SECTION: C Attempt All Questions.

(Marks: 6 X 2 = 12)

8. Write down the mathematical theorems required to apply the root finding method using the bisection method. Find out the root of the function $3x + 5 = 0$ upto the accuracy of 0.001.
9. Write down the method of Newton Raphson for the root finding. Derive the error term and the convergence rate for this. Show and explain the conditions where the method fails.