Lab Assignment – 1 (2022)
PH-566

1. Write a FORTRAN program to evaluate the following expressions: (ALL the quantitites are real)

(i) $\frac{a^b}{b(b-a)}$; $for \quad a = 3.0, b = 4.0$

(ii) $\log_{10}(x) + \cos(a) + |x^2 + y^2| + 2\sqrt{xy}$; $for \quad x = 1.0, y = 2.0, a = 15^0$

(iii) $\frac{1}{a\sqrt{2\pi}} e^{\sqrt{2a(x-m)^3}}$; $for \quad x = 2.0, \; m = 1.0, \; a = 2.0$

2. Write a program that calculates the real roots of any quadratic equation $ax^2 + bx + c = 0$ for given values of a, b and c. The program should print a message on screen if the roots are COMPLEX and should also be able to solve the equation if a = 0.

3. Write a FORTRAN program to code the following function using IF-THEN-ELSE statement:

$f(x)=5x^2+3x+2$ for $x<2$
$=0$ for $x=2$
$=5x^2-3x+1$ for $x>2$

Hence, print the value of the function at x=-0.5, 0.1 and 2.5.

4. Single and double factorial of an integer N is defined as

N! = N×(N-1)×(N-2)…… ×3×2×1
N!! = N×(N-2)×(N-4)…….. ×3×1 (for N-odd)

Using the concept of d-loop, calculate the factorial and double factorial of a given number. Make sure, N is an odd integer for double factorial evaluation.

5. Use the DO loop to calculate the summations of the following series for given values of x and n

(i) 4 – 4/3 + 4/5 – 4/7 +…….. n-th term,

(ii) $1 + x/1! + x^2/2! + x^3/3! + \ldots\ldots + x^n/n!$

(iii) $1 - x^2/2! + x^4/4! + \ldots\ldots + (x^2)^n/(2n)!$

Also compare the result with (i) the constant π , (ii) e^x and (iii) cos(x) respectively.