

## Tutorial Questions

### Computer Programming and Applications

Q1. Design a FORTRAN program that reads an input temperature in degrees Fahrenheit, converts it to an absolute temperature in Kelvins, and writes out the results. Use IMPLICIT NONE statement and TYPE declaration statement in your program.

Q2. Write an algorithm for Newton Raphson Method. Give its limitations.

Q3. Write a Fortran program to compute potential temperature of a given sample of air of 500 hpa Level and temperature -10.0 deg. C which is compressed adiabatically to a Pressure of 1000 hPa Level.

Q4. Given  $g = -G \frac{M}{(R+h)^2}$  where  $g$  is acceleration due to earth's gravity at a height  $h$  above the surface of the earth,  $G = 6.6272 \times 10^{-11} \text{ Nm}^2/\text{Kg}^2$  is gravitational constant,  $M = 5.98 \times 10^{24} \text{ kg}$  is mass of earth,  $R = 6371 \text{ km}$  is mean radius of earth. Write a Fortran Program to calculate the acceleration due to earth's gravity in 500 Km increment at heights from 0 to 40,000 km above the surface of the earth. Print out the results in a Table.

Q5 Fill in the blanks. Attempt any 4.

1. Fortran 90/95 is a free source form, where each line of Fortran statement may be up to \_\_\_\_\_ characters long.
2. A\$ is an \_\_\_\_\_ variable name because \_\_\_\_\_.
3. 111E3 is not a valid real constant because \_\_\_\_\_.
4. The arithmetic operator is \_\_\_\_\_ used as Exponentiation in Fortran 90/95.
5. Example of Character Constant is \_\_\_\_\_.
6. In Fortran Hierarchy of operations, the topmost Hierarchy is \_\_\_\_\_.
  - a) operations within parenthesis is evaluated first, starting with the inner parenthesis and working outward.
  - b) All exponentials are evaluated from right to left.
  - c) All multiplications and division are evaluated from left to right
  - d) All relational operators are evaluated from left to right
  - e) All .NOT. operators are evaluated
  - f) All .AND. operators are evaluated from left to right
  - g) All .OR. operators are evaluated from left to right
  - h) All .EQV. and .NEQV. operators are evaluated from left to right
  - i) None of the above
7. A flowchart Parallelogram indicates an \_\_\_\_\_ or \_\_\_\_\_ operation.

Q6. State true or false with reason. Attempt any 3.

1. Never raise a negative number to a real power.
2. The relational operator == can be used in assignment statement.

3.  $3/10$  is 0 in Fortran 90/95
4. Always use Implicit none statements in the program
5. The value of the expression  $(13/5)*6$  is 12

Q7. Write short notes. Attempt any 2.

1. Flowcharts in Fortran 90/95
2. Advantages of Fortran 90/95

### FORTRAN PROGRAMS

**EXAMPLE 1** Convert a temperature from Centigrade to Fahrenheit.

**! Program for Centigrade to Fahrenheit**

**Program** centi\_Fahren

**Implicit none**

**Real :: C, F**

**Print \***, 'Please Type the value of Temperature in Centigrade'

**Read(\*,\*) C**

**F = C \* 9.0/5.0 + 32.0**

**Write(\*, "(1x,'Temperature in Fahrenheit is', f10.3)") F**

**End program** centi\_Fahren

**EXAMPLE 2** To find the slope and Midpoint of a Line

**! Program to find the slope and Midpoint of a line**

**Program** slope\_midpoint

**Implicit none**

**Real :: x1, y1, x2, y2, slope, X, Y**

**Print \***, 'Please Type the first point x1, y1'

**Read(\*,\*) x1, y1**

**Print \***, 'Now Please Type the second point x2, y2'

**Slope = (y2 - y1) / (x2 - x1)**

$$X = (x1 + x2) / 2.0$$

$$Y = (y1 + y2) / 2.0$$

Write(\*, "(1x,'Slope is', f10.3,/,',Midpoint is',1x,2(f10.3,1x) )") Slope, X, Y

End program slope\_midpoint

**EXAMPLE 3** Area of a Triangle.

**! Program for finding Area of a Triangle**

**Program** Area\_Triangle

**Implicit none**

**Real :: A, B, C, S, Area**

**Print \***, 'Please Type the sides of a Triangle A, B, C'

**Read(\*,\*)** A, B, C

$$S = (A + B + C) / 2.0$$

$$\text{Area} = \text{SQRT}(S * (S - A) * (S - B) * (S - C))$$

**Write(\*, "(1x,'Area of the Triangle is ', f10.3)")** Area

**End program** Area\_Triangle

**EXAMPLE 4** Velocity and Distance of a Particle.

**! Program to find velocity and distance of a particle**

**Program** Vel\_Distance

**Implicit none**

**Real :: a, t, S, V**

**Print \***, 'Please Type acceleration a and time t of a particle'

**Read(\*,\*)** a, t

$$S = (1.0/2.0) * a * t **2$$

**V = a\*t**

**Write(\*, "(1x,'Time =',1x,f10.3,/, 'Distance =',1x,f10.3,/, 'Velocity is', f10.3)") t, S, V**

**End program Vel\_Distance**