LAB – 03 – Group A

Question No. 1 Let us consider how to calculate the yearly depreciation for some depreciable item, such as a building, a machine, etc. There are three commonly used methods for calculating depreciation, known as the *straight-line* method, the *double-declining-balance* method, and the *sum-of-the-years'-digits* method. We wish to write a C program that will allow us to select any one of these methods for each set of calculations.

The computation will begin by reading in the original (undepreciated) value of the item, the life of the item (i.e., the number of years over which it will be depreciated) and an integer that indicates which method will be used. The yearly depreciation and the remaining (undepreciated) value of the item will then be calculated and written out for each year.

The *straight-line* method is the easiest to use. In this method the original value of the item is divided by its life (total number of years). The resulting quotient will be the amount by which the item depreciates each year. For example, if an $8000 item is to be depreciated over 10 years, then the annual depreciation would be $8000/10 = $800. Therefore, the value of the item would decrease by $800 each year. Notice that the annual depreciation is the same each year when using straight-line depreciation.

When using the *double-declining-balance* method, the value of the item will decrease by a constant *percentage* each year. Hence the actual amount of the depreciation, in dollars, will vary from one year to the next. To obtain the depreciation factor, we divide 2 by the life of the item. The depreciation factor is multiplied by the value of the item *at the beginning of each year* (not the original value of the item) to obtain the annual depreciation.

Suppose, for example, that we wish to depreciate an $8000 item over 10 years, using the double-declining-balance method. The depreciation factor will be 2/10 = 0.20. Hence the depreciation for the first year will be 0.20 × $8000 = $1600. The second year's depreciation will be 0.20 × ($8000 – $1600) = 0.20 × $6400 = $1280; the third year's depreciation will be 0.20 × $5120 = $1024, and so on.

In the *sum-of-the-years'-digits* method the value of the item will decrease by a percentage that is *different* each year. The depreciation factor will be a fraction whose denominator is the sum of the digits from 1 to n, where n represents the life of the item. If, for example, we consider a 10-year lifetime, the denominator will be $1 + 2 + 3 + \cdots + 10 = 55$. For the first year the numerator will be n, for the second year it will be $(n - 1)$, for the third year $(n - 2)$, and so on. The yearly depreciation is obtained by multiplying the depreciation factor by the original value of the item.

To see how the sum-of-the-years'-digits method works, we again depreciate an $8000 item over 10 years. The depreciation for the first year will be (10/55) × $8000 = $1454.55; for the second year it will be (9/55) × $8000 = $1309.09; and so on.

Now let us define the following symbols, so that we can write the actual program.

`val` = the current value of the item

`tag` = the original value of the item (i.e., the original value of `val`)

`deprec` = the annual depreciation

`n` = the number of years over which the item will be depreciated

`year` = a counter ranging from 1 to `n`

`choice` = an integer indicating which method to use

Our C program will follow the outline presented below.

1. Declare all variables, and initialize the integer variable `choice` to 0 (actually, we can assign any value other than 4 to `choice`).
2. Repeat all of the following steps as long as the value of `choice` is not equal to 4.
   (*a*) Read a value for `choice` which indicates the type of calculation to be carried out. This value can only be 1, 2, 3 or 4. (Any other value will be an error.)
   (*b*) If choice is assigned a value of 1, 2 or 3, read values for `val` and n.
   (*c*) Depending on the value assigned to `choice`, branch to the appropriate part of the program and carry out the indicated calculations. In particular,
      (*i*) If `choice` is assigned a value of 1, 2 or 3, calculate the yearly depreciation and the new value of the item on a year-by-year basis, using the appropriate method indicated by the value of `choice`. Print out the results as they are calculated, on a year-by-year basis.
      (*ii*) If `choice` is assigned a value of 4, write out a "goodbye" message and end the computation by terminating the `while` loop.
      (*iii*) If `choice` is assigned any value other than 1, 2, 3 or 4, write out an error message and begin another pass through the `while` loop.

2. Admission to a professional course is subject to the following conditions:
   a. Marks in Mathematics >= 60
   b. Marks in Physics >= 50
   c. Marks in Chemistry >=40
   d. Total marks in all three subjects >= 200

   or

   Total in Mathematics and Physics >= 150

   Given the marks in the three subjects, write a program to process the application to list the eligible candidates.