

King Saud University
College Of Engineering
Department Of Chemical Engineering

GE 209 Computer Programming
2^{ed} Semester 1428/1429 H
Time Allowed: 2 Hours



QUESTION (1) [10 Pts]

(a) Examine the following Fortran statements and tell whether or not they are valid. If they are invalid indicate the reason.

Statement	Valid or Invalid	Reason
<pre> Loop1: do i=1,10 Loop2: do j=1,10 Loop3: do i=i,j End do loop3 End do loop 2 End do loop1 </pre>	Invalid	Index i in Loop1 is used again ain changed in loop3
<pre> If(Temp. > 37.0) then Write(*,*) "High human body temp" Else if (Temp >100.) End if </pre>	Invlaid	Else missing before the End if
<pre> Real, dimension(12) :: a Real :: ave, sd Integer ::n Call sv_sd(a,n,av,sd) End Subroutine sv_sv(arr,nva,aver,sd) Real ::nva, avr,sd Real :: arr(12) Return End </pre>	Invalid	<p>n is integer in the main program while its corresponding nva in the subroutine is declared to be a real</p> <p>av used in the Call statement is define but this will not cause an error</p>
<pre> Implicit none Real :: time Time=10.0 Write(*,*) "Time is", tmie end </pre>	Invalid	Tmie has no type and was not defiend, since when using Implicit none all used variables should be declared

(b) Consider the following program

<pre> Real:: A(2:3,5:7) Open (Unit=2, File="IN.DAT",Status="OLD") Read (2,*)A End </pre>	An input file IN.DAT contains the following values 5.0, 7.0, 9.0, -10.0,-100.0,999.0
	What are the values of :the following: A(3,5)=7.0 A(2,7)= -100.0 A(1,1)=not defined (error)

(c) Examine the following DO loop. Determine the value of ISUM at the end of the loop and also the number of times the loop executes.

<pre> DO ISUM=ISUM + 1 IF ((ISUM /10)*10 == ISUM)EXIT END DO </pre>	<p>ISUM = 10</p> <p>NUMBER of iteration = 10</p>
---	--

QUESTION (3) [10 Pts]

Follow the execution of the following program:

```
PROGRAM Definite_Integral
IMPLICIT NONE
REAL:: A, B
INTEGER:: Number_of_Subintervals
A = 1.0
B = 6.0
Number_of_Subintervals = 5
CALL Integrate (A, B, Number_of_Subintervals)
END PROGRAM Definite_Integral
```

!Subroutine to calculate the trapezoidal approximation of the integral
!of the function Integrand over the interval [A, B] using N subintervals.

```
SUBROUTINE Integrate (A, B, N)
REAL:: A, B, Integrand
INTEGER:: J, N
REAL:: DeltaX, X, Y, Sum
DeltaX = (B - A)/ REAL(N)
X = A
Sum = 0.0
DO J = 1, N-1
X = X + DeltaX
Y = Integrand(X)
Sum = Sum + Y
PRINT *, J, Integrand(X), Sum
END DO
Sum = DeltaX + ((Integrand(A) + Integrand(B))/2.0 + Sum)
END SUBROUTINE Integrate

REAL FUNCTION Integrand(X)
REAL:: X
Integrand = X**2
END FUNCTION Integrand
```

J	Integrand(X)	Sum
1	4.0	4.0
2	9.0	13.0
3	16.0	29.0
4	25.0	54.0

QUESTION 4 [10 Pts]

The resistance of a metallic material is increased by increasing the temperature according to the following relation

$$R_2 = R_1[1 + \alpha(T_2 - T_1)]$$

where,

R_1 is the resistance of the material at temperature T_1 ,

R_2 is the resistance of the material at temperature T_2 ,

α is temperature coefficient of resistivity.

You are given thirty metals each has different α and R_1 . For a given values of T_1 and T_2 ($0 < T_1 \leq 100, 50 \leq T_2 < 350$), write a Fortran program to do the following:

- (a) Read the temperatures T_1 and T_2 . (*only one reading for each*)
- (b) For the given range of T_1 and T_2 , calculate and print out the value of R_2 for each metal.
- (c) If T_1 and T_2 are not in the given range, print out the following message:
 T_1 or T_2 is out of the given range.
- (d) Calculate and print out the average value of all resistors R_2 (call it R2av).

```
Real:: r1,r2,t1,t2, alpha
```

```
Sum=0.0
```

```
Read*, T1,T2
```

```
If((T1>0.0.and.T1<=100.0).or.(T1>=50.0.and.T2<350.0))then
```

```
  Do i=1,30
```

```
    Read*,R1,alpha
```

```
    R2=R1*(1+alpha*(T2-T1))
```

```
    Print*, R2
```

```
    Sum=sum+R2
```

```
  EndDo
```

```
  R2av=sum/30.0
```

```
  Print*, R2ave
```

```
Else
```

```
  Print*, 'T1 and T2 out of the given range'
```

```
Endif
```

```
Stop
```

```
End
```