King Fahd University of Petroleum & Minerals
College of Computer Sciences & Engineering
Department of Information and Computer Science

ICS 101 Computer Programming
Final Exam – 093
120 Minutes

Question	Out of	Earned
1	7	
2	4	
3	6	
4	6	
5	4	
6	6	
7	6	
8	8	
9	8	
10	6	
11	6	
12	6	
13	6	
14	6	
15	15	
Total	100	

Wednesday, August 25, 2010

Question 1 [7 points]: The following program reads integer values from a data file INPUT.DAT and puts the even values in the file EVEN.DAT and the odd values in the file ODD.DAT. The number of lines in the input file is not known. Each line of the file contains one integer number. Complete the missing parts.

```
      INTEGER NUM

1 POINT OPEN( UNIT=20, FILE='INPUT.DAT', STATUS='OLD' )

1 POINT OPEN( UNIT=30, FILE='ODD.DAT', STATUS='UNKNOWN' )

1 POINT OPEN( UNIT=40, FILE='EVEN.DAT', STATUS='UNKNOWN'

100   READ( 20, *, END = 200            ) NUM 2 POINTS
      IF ( MOD( NUM, 2) .EQ. 1 ) THEN
         WRITE(30, *) NUM
      ELSE
         WRITE(40, *) NUM
      ENDIF

      GOTO 100 2 POINTS
200   PRINT*, 'DONE'
      END
```

THE ORDER IS NOT IMPORTANT. UNIT 30 SHOULD BE WITH 'ODD' AND 40 WITH 'EVEN'. FOR INPUT ANY NUMBER COULD BE USED AS FAR AS IT IS USED IN THE READ

Question 2 [4 points]: The output of the program given below is as follows:

```
 TEST = -3.527  M=***
 TEST =    -3.53  M=2531

M = 2531  TEST = -3.5270
```

Complete the missing parts such that the output is as given above.

```
      REAL TEST
      INTEGER M
      TEST = -3.527
      M = 2531
      PRINT 10, TEST, M
      PRINT 20, TEST, M
      PRINT 30, M, TEST
10    FORMAT(' ', 1X, 'TEST =', 1X, F6.3, 2X, 'M=', I3) 1 POINT
20    FORMAT(' ', 1X, 'TEST =', 4X, F5.2, 2X, 'M=', I4) 1 POINT
30    FORMAT('0', 'M =', 1X, I4, 2X, 'TEST =', 1X, F7.4) 2 POINTS
      END
```

MANY POSSIBLE CORRECT ANSWERS. MIGHT REPLACE 1X, F6.3 BY F7.3. MIGHT ADD THE BLANKS INSIDE THE QUOTATION OF THE TEXT INSTEAD OF USING NX. MIGHT REPLACE 4X, F5.2 BY F9.2.

Question 3 [6 points]: What will be printed by the following program?

```
      REAL A(30), B(30), DOT, Z
      INTEGER K, N
      READ*, N,  (A(K), B(K), K=1,  N)
      Z = DOT(N, A, B)
      PRINT 10, Z
10    FORMAT(' ', 'DOT PRODUCT = ', F5.1)
      END
      REAL FUNCTION DOT(M, X, Y)
      INTEGER M, I
      REAL X(M),Y(M), SUM
      SUM = 0.0
      DO 123 I = 1,  M
         SUM = SUM + X(I)* Y(I)
123   CONTINUE
      DOT = SUM
      RETURN
      END
```

Assume the input for the program is:

```
4    1    2    3    4    5    6    7    8
```

Output:

```
DOT PRODUCT = 100.0
```

1 POINT

4 POINTS FOR 100. 1POINT FOR THE FORMAT

Question 4 [6 points]: What will be printed by the following program?

```
      REAL MAT(2,3), I, J
      READ*,(( MAT(I, J), I=1,2),J=1,3)
      DO 10 I= 1, 2
         PRINT 55, (MAT(I, J), J=1,3)
10    CONTINUE
55    FORMAT(' ', F4.1, 2X, F4.1, 2X, F4.1, 2X)
      END
```

Assume the input for the program is:

```
10    20    30    40    50    60
```

Output:

```
10.0  30.0  50.0
20.0  40.0  60.0
```

1 POINT FOR EACH ENTRY

Question 5 [4 points]: Complete the following program in order to get the required output.

```
      INTEGER Y
      REAL X
      X = -20.2451
      Y = 25
      PRINT 6, X, 'AND', Y

6     FORMAT (‘ ’,5X, F6.2, 3X, A, 3X, I2)
      END
```

SEVERAL OTHER POSSIBLE SOLUTIONS ARE AVAILABLE. ONE OF THEM IS:
‘ ‘, F11.2, 3X, A3, I5

The required output is:

```
     -20.25   AND   25
```

Question 6 [6 points]: What will be printed by the following program?

```
      REAL B(2,3), F
      INTEGER J, K
      F(X, Y) = X + Y * 2
      READ*, ((B(J,K), K = 1, 2), J = 1, 2)
      DO 2 J = 1, 2
         B(J,3) = F(B(J,1), B(J,2))
2     CONTINUE
      PRINT*, B
      END
```

Assume the input is:

```
10, 20, 30, 40
```

OUTPUT:

```
10.0    30.0    20.0    40.0       50.0     110.0
```

0.5 POINT EACH

2 POINT

Question 7 [6 points]: What will be printed by the following program?

```
      SUBROUTINE ADD(A, B, C)
      INTEGER A(2,2), B(2,2), C(2,2) , J, K
      DO 33 J = 1, 2
         DO 22 K = 1, 2
            C(J,K) = A(J,K) + B(J,K)
22       CONTINUE
33    CONTINUE
      RETURN
      END
      INTEGER X(2,2), Y(2,2), Z(2,2)
      READ*, X, Y
      CALL ADD (X, Y, Z)
      PRINT*, Z
      CALL ADD (Z, Y, X)
      PRINT*, X
      END
```

Assume the input is:

```
5, 6, 7, 8, 9, 10, 11, 12
```

OUTPUT:

```
14      16      18      20      0.5 point each
23      26      29      32      1 point each
```

Question 8 [8 points]

The following program has a subroutine IDINIT that takes a 2-D integer array IMAT of size 3 X 3 and initializes the array as an identity matrix. The main program tests the subroutine. Complete the missing parts.

```
      SUBROUTINE   IDINIT(IMAT)  4  POINTS
      INTEGER IMAT(3,3), J, K
      DO  77    K = 1, 3
         DO  77  J = 1, 3
         IMAT(K, J) = 0
         IF (K .EQ. J) IMAT(K, J) = 1
77    CONTINUE
      RETURN
      END
      INTEGER IMAT(3,3), K
      READ*, IMAT

      CALL IDINIT(IMAT)  4  POINTS

      DO 77  K = 1, 3
         PRINT*, IMAT(K,1),IMAT(K,2),IMAT(K,3)
77    CONTINUE
      END
```

Question 9 [8 points]: The following program reads a 2-D integer array X of size 3 X 4. The program stores the sum of each row in a 1-D array ROW and the sum of each column in a 1-D array COL. Then it prints arrays ROW and COL. Complete the missing parts.

```
      INTEGER X(3,4) , ROW(3) , COL(4), J, K
      READ*, X
      DO 55  K = 1, 3
         ROW(K) = 0
         DO 55   J = 1, 4

            ROW(K) = ROW(K)+ X(K,J)    4 POINTS
55    CONTINUE
      DO 66  J = 1, 4
         COL(J) = 0
         DO 66 K = 1, 3

            COL(J) = COL(J) +X(K,J)    4 POINTS
66    CONTINUE
      PRINT*, ROW
      PRINT*, COL
      END
```

Question 10 [6 points]: What will be printed by the following program?

```
      INTEGER X(3), Y(3), K
      LOGICAL Z(3)
      READ*, X
      READ*, Y
      DO 80 K = 1, 3
         Z(K) = X(K) .EQ. Y(K)
80    CONTINUE
      IF(Z(1) .AND. Z(2) .AND. Z(3)) THEN
         PRINT*, 'OK '
      ELSE
         PRINT*, 'NOT'
      ENDIF
      END
```

Assume the input for the program is:

```
1, 5, 7
7, 5, 1
```

```
NOT          6 POINTS
```

Question 11 [6 points]: What will be printed by the following program?

```
      SUBROUTINE FUN(A)
      INTEGER A(4), TEMP
      TEMP = A(1)
      A(1) = A(2)
      A(2) = A(3)
      A(3) = A(4)
      A(4) = TEMP
      RETURN
      END
      INTEGER LIST(4)
      READ*, LIST
      CALL FUN (LIST)
      PRINT*, LIST
      END
```

Assume the input for the program is:

```
3, 6, 9, 2
```

```
OUTPUT:
6    9    2    3      1.5 Points Each
```

Question 12 [6 points]: The following subroutine has 4 parameters: A, N, X and Y, where A is an integer array of size N and X and Y are integer numbers. The subroutine changes each element of A that has the value X by the value Y. Complete the missing parts.

```
      SUBROUTINE CHANGE(A, N, X, Y)
      INTEGER N, A(N), X, Y, K
      DO 20 K=1,N

         IF (A(K) .EQ. X) THEN            2 POINTS

            A(K) = Y                      2 POINTS
         ENDIF
20    CONTINUE

      RETURN                               2 POINTS
      END
```

Question 13 [6 points]: The following Program has a subroutine REVRSE that reverses a 1-D real array DAT with N elements. The main program tests the subroutine. Complete the missing parts.

```
      SUBROUTINE REVRSE (DAT, N)
      INTEGER N, K
      REAL DAT(N), TEMP
      DO 41 K = 1, N / 2
         TEMP = DAT(K)
         DAT(K)  = DAT (N+1-K)         2 POINTS

         DAT (N+1-K)  = TEMP           2 POINTS

41    CONTINUE
      RETURN
      END
      REAL DAT(5)
      READ*, DAT

      CALL REVRSE (DAT, 5)             2 POINTS
      PRINT*, DAT
      END
```

Question 14 [6 points]: The following program calculates the summation:

$$\sum_{k=1}^{200}\left((-1)^{k}\frac{5k}{k+1}\right)$$

Complete Missing parts.

```
      REAL SUM
      INTEGER K
      SUM = 0
      DO 10 K = 1, 200

      SUM = SUM + (-1) ** K * 5.0 * K / (K + 1)
10    CONTINUE
      PRINT*, SUM
      END
```

IF THESE 2 PARENTHESES ARE MISSING -2 points should

IF THESE 2 PARENTHESES ARE MISSING -3 points should be taken. Extra parentheses in right places should not affect.

A second possible solution is:
SUM = SUM + (-1) ** K *((5.0 * k) / (K + 1))

Question 15 [15 points]

Write a FORTRAN function SEARCH that searches for an integer number K in the array A of size N. If the number is found, the index of the element of the array is returned. Otherwise, a zero value is returned.

```
INTEGER FUNCTION SEARCH(A, N, K)      FUNCTION HEADER: 3 POINTS
INTEGER N, A(N), K, J                  DECLRATION: 2 POINTS (N BEFORE A(N))
LOGICAL FOUND
SEARCH = 0                 THE NAME OF THE FUNCTION APPEARS 2 TIMES IN THE LEFT
J = 1                      SIDE OF AN ASSIGNMENT ONE OF THEM WITH ZERO  4 POINTS
FOUND = .FALSE.
DO WHILE (.NOT. FOUND .AND. J .LE. N)
    IF (A(J) .EQ. K) THEN
        FOUND = .TRUE.
        SEARCH = J          REMAINING PROCESS  IF – DO – WHILE – OR IF AND GO TO
    ELSE                        4 POINTS
        J = J + 1
    ENDIF
END DO
RETURN                                 RETURN STATEMENT 2 POINTS
END
```