THE OPEN UNIVERSITY OF SRI LANKA
B.Sc/B.Ed Degree Programme/Continuing Education Programme
APPLIED MATHEMATICS - LEVEL 04
PSU2180/ PSE4180/PCU2140 – Computing for Scientific Studies using
FINAL EXAMINATION 2011/2012



DURATION: TWO HOURS.

DATE: 23.11.2012	TIME: 1.30pm - 3.30pm

Answer **ALL** Questions **in Section A** and **only TWO** questions **in Section B.**
Marks allocation: **40** marks for **Section A** and **60** marks for **Section B.**

Non programmable calculators are permitted.

SECTION A

Answer all questions in this section.

1. State whether each of the following is acceptable as an integer variable, a real variable or neither. *If you decide as the last category, give reasons.*

   a) EXPLICIT b) EXPENDITURE c) INVEST d) N-DAYS e) YEAR_CODE

2. The only type declaration statement a program has is
   IMPLICIT CHARACTER*6 (A-H), CHARACTER*5 (L)
   In the above program, state whether or not each of the following is acceptable as a character variable, If you decide as not acceptable, give reasons.

   a) REVENUE b) ASSET c) LIABILITY d) IDNO e) HOUSE

3. Write down FORTRAN expressions for each of the following mathematical expressions given in the usual notation.

   a) $(\sqrt{a}+2b)$ b) $\left(x^{y}+y\right)^{3}-2x$ c) $\sqrt{|(4x-y)|}$ d) $x^{a}\cos(a+bx)$

   e) $2(\log_{10}(|y|)+4y)$

4. Write down equivalent mathematical expressions for the following FORTRAN expressions.

   a) (2*FLOAT(X))**2 b) 2.0/X/X+X/Y c) (2.0+X/Y)**(X+1.0)

   d) ATAN(X)-X+Y e) (X*Y)**3+2/X

5. A program has the following statements. State whether each of the following is *acceptable to fill in the blank labelled as bb. If not, give reasons.*

   INTEGER GRADE
   GRADE = bb
   a) 10.0 b) -23 c) 1.0E-02 d) 2E3.0 e) 0

6. A program has the following statements. State whether each of the statements labelled as (a), (b),(c),(d),(e),(f),(g) is correct or not. If the statement is not correct, state how you would correct it.

```
      INTEGER SUM, CREDIT
      REAL GPA

        (a) SUM = 0.0
        (b) READ *,CREDIT
        (c) IF (CREDIT .LE. 0) THEN PRINT*, 'WRONG INPUT'
        (d) DO 10 I=1,7,2
        (e) PRINT*,'SUM IS',SUM
        (f) SUM = SUM+CREDIT
10    CONTINUE
        (g) GPA=SUM/4
11    STOP
      END
```

7. A program has the following statements. Write down the values assigned for the variables labelled X1,X2,X3,X4 and X5. If no value is assigned due to an error in the statement, clearly state what the error is.

```
INTEGER I,J,K,SUM
REAL A,TEMP
REAL X1,X2,X3,X4,X5
A=6.8
TEMP = 20.0
I=3
J=I+1
K=J+1
X1=FLOAT*I
X2=J/A
X3=NINT(A)
X4=INT(A)/A+TEMP
X5=2.0*REAL(I)
STOP
END
```

8. Assuming that A, B and C are logical variables determine the values of the following logical expressions for all possible values of A, B and C.

a) A . AND.. (B .OR. C)
b) .NOT.A .AND. (B ,AND, C)
c) (A .AND. B). OR. (.A.AND.C)
d) (A .AND. B) .OR. C
e) .NOT. (A .AND. B .AND. C)

Let A, B, C be real variables and I be an integer variable. Write FORTRAN statements to execute the following instructions.

a) If the value of A or the value of B are negative, print the error message that " the input values are wrong".
b) To assign the average of the values of A and B to the variable C.
c) To divide A by B and then add three and assign the answer to C.
d) To assign the absolute value of the difference between A and B to the variable C.

An input line contains the following data, starting from column 1.

23134501

Write statements to read this line of data and make the assignments given in each of the following statements.

a) input the value 231.3 to the variable A and the value 45.01 to the variable K.
b) input the value 23 to the variable K and the value 1 to the variable J and the value 34.501 to the variable R.
c) input the value 23134.5 to the variable A and the value 1 to the variable K.

SECTION B

Answer any TWO questions from this section

A researcher collected information on the student identification number, day school attendance and the final mark of each student offering a mathematics course, Student identification number is a record with three digits. Day school attendance is a record with 1 digit with codes 1, 2 and 3 representing the categories of no attendance, poor attendance and fairly good attendance respectively. The mark for the course is an integer ranging from 0 to 100 with 0 recorded as 000, 1 recorded as 001 etc. The information on the three variables is recorded in a data file as a number with 7 digits with first three digits standing for the identification number, fourth digit representing the category for day school attendance and the last three digits representing the final mark for the course. As an example, the second column of the following table gives the data records for two students which are as described in the third column.

Example	Data record	Description of the data		
		Identification number	Attendance	Final mark
1.	0012014	001	Poor	14
2	0373099	037	Fairly good	99

Suppose the data file has 250 rows representing the records of 250 students.

Write a FORTRAN program to read the data and to compute the average marks of students belonging to the three categories of day school attendance.

2. Write a FORTRAN program and a subroutine that carry out the following instructions.
The main program should take the marks of 250 students, which are integers ranging from 0 to 100 as input data, assign to a variable called MARKS and print the total number of students, the values of the variable MARKS and the frequencies of marks as computed by the subroutine, described below.

The subroutine should take MARKS as input data and produce an array labelled FREQ, which contains the numbers of students in each of the mark ranges 0 to 39, 40 to 54, 55 to 69 and 70 and above as the output.

3. Write a FORTRAN program to compute the following four partial sums and print each one of them together with the identification number. The program should be written in general terms so that by a simple change in the input values we should be able to use the program to compute the partial sum for any identification number n. If the value of any of the sums prior to taking the absolute value is negative, the program should also print the corresponding identification number and the statement that the sum is negative. Here the notation $|x|$ denotes the absolute value of x.

Identification number	partial sum
1	$\left\|1-\frac{7}{3}\right\|$
2	$\left\|1-\frac{7}{3}+\frac{7}{3^2}\right\|$
3	$\left\|1-\frac{7}{3}+\frac{7}{3^2}-\frac{7}{3^3}\right\|$
4	$\left\|1-\frac{7}{3}+\frac{7}{3^2}-\frac{7}{3^3}+\frac{7}{3^4}\right\|$

4. The temperatures of two cities measured on 50 days are stored in two arrays labelled c1 and c2 such that the row k gives the temperature of day k.

Write a FORTRAN program to carry out the following instructions.

1. Print the number of days n1 and n2 for which temperatures in City 1 and City 2 are less than 20 ^0C respectively.
2. Print the number of days in which the temperature in City 1 is less than that of City 2.
3. Print a 50x2 matrix M1 such that the first column of M1 is the day and the second column is the absolute difference of the temperatures in the two cities in that day.

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