

ADCA / MCA (II Year)

Term-End Examination

June, 2010

CS-08 : NUMERICAL AND STATISTICAL
COMPUTING

Time : 3 hours

Maximum Marks : 75

- Note :** (i) Use of calculator is *allowed*.
(ii) Question number 1 is *compulsory*. Answer *any three questions from the rest*.

1. (a) Write a FORTRAN 90 statement for each of the following : 10x3=30

$$(i) \quad \alpha = \left(\frac{4}{x} + \frac{7}{y} - z \right)^{1/2}$$

$$(ii) \quad V = (\alpha + \beta^2 + \alpha\beta)^5 / \sqrt{\alpha + \beta + 1}$$

$$(iii) \quad t = \left(\frac{a}{b} + 1 \right)^r + \left(1 - \frac{a}{b} \right)^s$$

- (b) Which of the following are acceptable real variable names ? If a name is not acceptable, state why ?

- (i) Z 571 (ii) Y CUBE
(iii) Y + Z (iv) TEMPERATURE
(v) MB4 (vi) SPACE

- (c) Pick the incorrect type declaration from the following list. Explain why they are incorrect ?
- (i) INTEGER, SAYAN, COUNT, SUMI, PRODT
 - (ii) REAL, INTRS, MASS, NET
 - (iii) INTEGER ACTUAL.1 SUM
- (d) How many times will each of the loops controlled by the following Do statements be executed ?
- (i) DO 40 I= -10, 10 40 CONTINUE
 - (ii) DO 20 J=1, 12, 3 20 CONTINUE
 - (iii) DO 90 K=17, 15, -1 90 CONTINUE
- (e) Economic Order Quantity may be calculated from the equation

$$Q = \sqrt{\frac{2RS}{I}}$$

Where R is the yearly requirement, S the set-up cost and I the carrying cost per item. The values of R , S , and I for 15 items in a factory are given.

Write a FORTRAN program using DO loop to calculate the Economic Order Quantity for each of these items.

- (f) Write a FORTRAN program that reads three numbers, X_1 , X_2 and X_3 and computes their average \bar{X} and standard deviation SD, where

$$\bar{X} = \frac{X_1 + X_2 + X_3}{3}$$

$$SD^2 = \frac{X_1^2 + X_2^2 + X_3^2 - 3\bar{X}^2}{3}$$

Also print the average and standard deviation.

- (g) Following table gives the data on rainfall and discharge in a certain river. Obtain the line of regression of y on x .

Rainfall x (inches)	1.53	1.78	2.60	2.95	3.42
Discharge y (1000 cc)	33.5	36.3	40.0	45.8	53.5

- (h) Find the value of p if the mean of the following frequency distribution is 7.5.

x	3	5	7	9	11	13
f	6	8	15	p	8	4

- (i) An urn contain 10 balls of which three are black and seven are white. At each trial, a ball is selected at random, its colour is noted and it is replaced by two additional balls of the same colour. What is the probability that a white ball is selected in the second trial ?

- (j) Calculate the mean and standard deviation for the following :

Size of item	Frequency
6	3
7	6
8	9
9	13
10	8
11	5
12	4

2. (a) Write a FORTRAN program which will sum up the terms in the series. $3 \times 5 = 15$

$$S = 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{100}$$

and print the result,

- (b) Suppose that an automobile starts from rest and has constant acceleration f for t seconds. The final velocity v and the distance travelled ' d ' by the automobile is given by the formula.

$$v = ft \text{ and } d = \frac{1}{2} ft^2.$$

Write a FORTRAN program that reads f and t , and print t , d and v .

- (c) Compute the approximate value of the

$$\text{integral } I = \int_0^3 \frac{1}{1+x^2} dx.$$

Using Simpson's $\frac{1}{3}$ rd rule by taking interval size 'h' as half.

3. (a) Write a FORTRAN program which will store the largest of three inputs A, B, and C into location BIG. Also print A, B, C and BIG. 3x5=15
- (b) Write a FORTRAN program for temperature conversion that gives the user the option of converting Fahrenheit to Celsius or Celsius to Fahrenheit and depending upon user's choice carries out the conversion.
- (c) The following table gives the forecasts for a model and the actual demands that occurred.

Week	Forecast	Actual
1	800	900
2	850	1000
3	950	1050
4	950	900
5	1000	900
6	975	1100

Compute the MAD.

4. (a) An anti-aircraft gun can take a maximum of four shots on enemy's plane moving away from it. The probabilities of hitting the plane at first, second, third and fourth shots are 0.4, 0.3, 0.2 and 0.1 respectively. Find the probability that the gun hits the plane. 3x5=15

- (b) Let x be the continuous random variable with probability density function.

$$f(x) = \begin{cases} kx^2, & -1 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

- (i) Find the constant K
(ii) Find $p(0 < x \leq 1)$
- (c) Are any of the following sequence illegal in standard FORTRAN 77? If So, indicate why they are illegal.

- (i)

```
DO 3 I=1,5
      DO 3 J=2, 6, 5
          K=I * J-2
          PRINT *, K
3 CONTINUE
```
- (ii)

```
IF (J) 20, 20, 30
      DO 20 I=I, 10
20 PRINT *, I, I ** 2
30 PRINT *, 'OVER'
```

5. (a) Historical demand for a product is : **3x5=15**

<u>Demand</u>	
January	12
February	11
March	15
April	12
May	16
June	15

- (i) Using a weighted moving average with weights of 0.60, 0.30, and 0.10, find the July forecast.
- (ii) Using a simple three - month moving average, find the July forecast.
- (b) The diameter of an electric cable is assumed to be continuous random variate with p.d.f. (probability density function).

$$f(x) = \begin{cases} 6x(1-x), & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

- (i) Verify the above is probability density function.
- (ii) Find the mean
- (c) In a bolt factory A, B, and C manufacture 25%, 35% and 40% of the total output respectively. Of their output, 5%, 4%, and 2% are defective bolts. A bolt is chosen at random and found to be defective. What will be the probability that the bolt came from machine A, B, and C ?

6. (a) In a certain factory turning out razor blades, there is a small chances of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing. 3x5=15
- (i) no defective
 - (ii) one defective and
 - (iii) two defective blades
- respectively in a consignment of 10,000 packets.
- (b) What value will be stored in location K at the end of the following sequences ?
- (i)


```

K = 0
DO 10 J = 1, 3
      DO 10 N = J + 1, 4
10 K = K + J * N
PRINT *, K
      
```
 - (ii)


```

DO 30 J = 1, 4, 3
      K = 0
      DO 30 N = 1, 5
30 K = K + N
PRINT *, K
      
```
- (c) (i) Define an EQUIVALENCE statement. What are its advantages ?
- (ii) Define Sequential and Direct files. Discuss their advantages and disadvantages.