

## ADCA / MCA (II Year)

## Term-End Examination

December, 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) What is the final value of A in the following program ?

10x3=30

$$A = 4.56$$

$$A = (A + 0.05) * 20$$

$$I = A$$

$$A = I$$

$$A = A / 10.0$$

Further, if the value of A were taken as 4.54 instead of 4.56 at the beginning of the above program, what would be the final value ?

- (b) What is the value of I calculating in the following arithmetic statements ?

(i)  $I = J * 4 / 5 + K / 2 + 8 - J ** 3 / 8$

$$(J = 2, K = 5)$$

(ii)  $I = B / 2.0 + B * 6.0 / (A - B) + A ** 4$

$$(A = 1.5, B = 4.0)$$

(iii)  $I = J / 2 * 4 + 5 / 2 + J ** 4$

$$(J = 3)$$

- (c) Write a FORTRAN 90 statement for each of the following :

(i) 
$$s = \frac{p^2 - q^2}{p^3 + q^2} + \frac{rt^3}{8t}$$

(ii) 
$$x = 4s^3 + \sqrt{(ab)^d}$$

(iii) 
$$s = ut + \frac{1}{2} ft^2$$

- (d) The mean of 200 items was 50. Later on it was discovered that two items were misread as 92 and 8 instead of 192 and 88. Find the correct mean ?
- (e) Suppose X, Y and Z have been defined. Write a FORTRAN program fragment which interchanges the value of X, Y and Z so that X has Y's value, Y has Z's value, and Z has X's value.
- (f) The horizontal range of a projectile fired at an angle A is

$$\text{Range} = \frac{u^2}{g} \sin(2A).$$

Where  $u$  is the velocity of the projectile and  $g$  is the acceleration of gravity ( $g = 9.8 \text{ ms}^{-2}$ ). Assuming a projectile velocity of 90 m/sec, write a FORTRAN program that will print a table of distances achieved by the projectile for angles of inclination A from  $10^\circ$  to  $80^\circ$ . Use the sign function of the system - i.e. SIN (X) where X is an angle expressed in radians.

- (g) Find the regression line of  $y$  on  $x$  for the following data :

$x :$	5	7	8	4	6
$y :$	2	4	3	2	4

- (h) If the mean of the following frequency distribution is 14, find the value of  $k$ .

$x :$	5	10	15	20	25
$f :$	7	$k$	8	4	5

- (i) One bag contains 4 white balls and 3 black balls, and a second bag contains 3 white balls and 5 black balls. One ball is drawn from the first bag and placed unseen in the second bag. What is the probability that a ball now drawn from the second bag is black ?
- (j) What value will be stored in location K at the end of the following sequence ? Justify your answer.

DO 40            J=1, 5

K=0

DO 40            N=1, 5

40    K=K+N

PRINT \*, K

2. (a) In an electrical engineering class, there are 20 juniors, 15 seniors and 5 graduate students. If the juniors averaged 71 in the mid-term examination, the seniors averaged 80 and the mean for the entire class is 76.625, then find the average for the graduates. 3x5=15

- (b) Calculate the Cost of Living Index Number from the table given below :

Sl. No.	Group	Index for 2008	Expenditure
1	Food	5500	46%
2	Clothing	2150	10%
3	Fuel and Lighting	2200	7%
4	House Rent	1500	12%
5	Miscellaneous	2750	25%

- (c) A food processor uses a moving average to forecast next month's demand. Past actual demand (in units) is as shown in the accompanying table :

Month	43	44	45	46	47	48	49	50	51
Actual Demand	105	106	110	110	114	121	130	128	137

- (i) Compute a simple 5-month moving average to forecast demand for month 52.
- (ii) Compute a weighted 3-month moving average where the weights are highest for the latest months and descend in order of 3, 2, 1.
3. (a) Write a FORTRAN program to read 50 numbers  $a_1, a_2, a_3, \dots, a_{50}$  and print them in the order  $a_{50}, a_{49}, a_{48}, \dots, a_1$ . 3x5=15
- (b) Write a FORTRAN program which will calculate and print out the product of all of the odd integers from 111 to 1111.
- (c) The moving-average forecast and actual demand for a hospital drug are as shown in the accompanying table.

Month	Actual Demand	Forecast Demand
27	71	78
28	80	75
29	101	83
30	84	84
31	60	88
32	73	85

Compute the MAD.

4. (a) A factory manufacturing televisions has four units A, B, C, D. The units A, B, C, D manufactures 15%, 20%, 30% and 35% of the total output respectively. It was found that out of their output 1%, 2%, 2% and 3% are defective. A television is chosen at random from the output and found to be defective. What is the probability that it came from the unit D ?  $3 \times 5 = 15$
- (b) A random variable X has the following probability function :

$x$	0	1	2	3	4	5	6	7
$p(x)$	0	K	2K	2K	3K	$K^2$	$2K^2$	$1K^2 + K$

- (i) find K
- (ii) Evaluate  $P(X < 6)$ ,  $P(X \geq 6)$ ,  $P(3 < X \leq 6)$
- (c) Calculate mean, variance and standard Deviation for the following distribution :

Classes	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	3	7	12	15	8	3	2

5. (a) The following regression equations were obtained from a correlation table :  $3 \times 5 = 15$

$$y = 0.516x + 33.73$$

$$x = 0.512y + 32.52$$

Find the value of

- (i) the correlation co-efficient
- (ii) the mean of  $x$ 's and
- (iii) the mean of  $y$ 's

- (b) What will be printed by the following program ?

```
PROGRAM      VYAS DEV
IMPLICIT     NONE
REAL        a, b, P, Q, R
INTEGER     X, Y, Z
            a = 2.5
            b = 4.0
            P = a + b
            X = a + b
            Q = a * b
            Y = a * b
            R = P / Q
            Z = X / Y

            PRINT *, P, Q, R
            PRINT*, X, Y, Z
            STOP
            END
```

- (c) The chances that doctor A will diagnose a disease X is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chances of death by wrong diagnosis is 70%. A patient of doctor A who had disease X, died. What is the chance that his disease was diagnosed correctly ?

6. (a) If 20% of the bolts produced by a machine are defective, determine the probability that out of 4 bolts chosen at random 3x5=15

- (i) 1  
(ii) 0  
(iii) at most 2  
bolts will be defective.

- (b) Write a FORTRAN 90 statement for each of the following :

(i)  $E = mc^2$

(ii) 
$$m = \frac{m_0}{\sqrt{1 - v^2/c^2}}$$

(iii)  $R = X^2Y^3 + \sqrt{(X + Y) Z}$

(iv) 
$$F = \frac{1}{4\pi\epsilon_0} \frac{Q_1Q_2}{r^2}$$

(v) 
$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

- (c) The sum of the squares of the first n natural numbers is given by

$$s = \frac{n(n+1)(2n+1)}{6}$$

Write a FORTRAN program that will find s for  $n = 10$  {10} 250, i.e.  $n = 10, 20, 30, \dots, 250$ .