ADIT / BIT PROGRAMME

Term-End Examination

June, 2010

00426

CSI-99 : STATISTICAL TECHNIQUES

Time : 3 hours   *Maximum Marks : 75*

Note : *Question No. 1 is compulsory. Answer any three questions from Question No. 2 to Question No. 5. Use of calculator is allowed.*

1. (a) Fill in the blanks :   5x1=5

    (i) The mode of the numbers
         9, 9, 9, 11, 12, 13, 13, 13, 14 is . . . .

    (ii) If the probability of hitting one shot be $p = 0.8$, then the probability that out of ten shots, seven will hit the target is . . . .

    (iii) Maximum value of probability is . . . .

    (iv) If $P(B) = 0.81$ and $P(A \cap B) = 0.18$, then $P(A/B) = $ . . . .

    (v) $f(x) = k \, x$ and 0 otherwise $0 < x < 1$, is a valid probability density function if $k = $ . . . .

(b) Which of the following statements are true ?
Give reasons for your answer.   5x1=5

   (i)   If the two regression lines are perpendicular to each other, then their coefficient of correlation is $\frac{\pi}{2}$.

   (ii) The mean of the Binomial distribution is npq.

   (iii) In the role of an ideal die, the probability of getting a prime number is 2/3.

   (iv) If the mean of a Poisson distribution is m, the S.D. of this distribution is $\sqrt{m}$.

   (v)   The smaller the coefficient of variation, the greater is the reliability or consistency in the data.

(c) Select the correct alternative.   5x1=5

   (i)   The probability that A passes a test is 2/3 and the probability that B passes the same test is 3/5. The probability that only one of them passes is.

      (A) 2/5   (B) 4/15

      (C) 2/15   (D) 7/15.

(ii) The probability that A happens is 1/3.
The odds against happening of A are.

(A) 2 : 1   (B) 2 : 3

(C) 3 : 2   (D) 5 : 2

(iii) Three identical dice are rolled. The
probability that the same number will
appear on each of them is.

(A) 1/6   (B) 1/36

(C) 1/18   (D) 3/28

(iv) A speaks truth in 60% cases and B
speaks truth in 70% cases. The
probability that they will say the same
thing while describing single event is.

(A) 0.56   (B) 0.54

(C) 0.38   (D) 0.94

(v) Two events A and B have probabilities
0.25 and 0.50 respectively. The
probability that both A and B occur
simultaneously is 0.14. Then the
probability that neither A nor B occur
is.

(A) 0.39   (B) 0.25

(C) 0.11   (D) None of these

(d) A random variable x has the following   5
    probability function.

Value of x	-2	-1	0	1	2	3
$p(x)$	0.1	k	0.2	2k	0.3	k

Find the value of k and calculate mean.

(e) The following table shows the marks   5
    obtained by 100 candidates in an
    examination. Calculate the mean and
    standard deviation.

Marks obtained	1-10	11-20	21-30	31-40	41-50	51-60
No. of candidates	3	16	26	31	16	8

(f) A student takes his examination in four   5
    subjects, P, Q, R, S. He estimates his chances
    of passing in P as 4/5, in Q as 3/4, in R as
    5/6, and S as 2/3. To qualify, he must pass
    in P and at least two other subjects. What
    is the probability that he qualifies ?

2. (a) A class has 10 boys and 6 girls. Three
       students are selected at random, one after
       the other. Find the probability that.   3x5=15
       (i) First and third are boys and second is
           a girl.
       (ii) First and third are of the same sex and
            second is of opposite sex.

(b) From a bag containing 5 white, 7 red, and 4 black balls, a man draws 3 balls at random. Find the probability that all are white.

(c) A purse contains 2 silver and 4 copper coins and a second purse contains 4 silver and 4 copper coins. If a coin is selected at random from one of the two purses, what is the probability that it is a silver coin ?

3. (a) The historical demand for a product is : **3x5=15**

Month	Demand
January	1200
February	1100
March	1500
April	1200
May	1600
June	1500

(i) Using a weighted moving average with weights of 0.50 for June, 0.30 for may, and 0.20 for April, find the July forecast.

(ii) Using a simple four-month moving average, find the July forecast.

(b) Out of 800 families with 5 children each, how many would you expect to have

(i) 3 boys

(ii) 5 girls,

(iii) either 2 or 3 boys ?

Assume equal probabilities for boys and girls.

(c) The students in a class are selected at random, one after the other, for an examination. Find the probability p that the boys and girls in the class alternate if
(i) the class consists of 4 boys and 3 girls
(ii) the class consists of 3 boys and 3 girls

4. (a) A function is defined as follows :   3x5=15

$$f(x) = 0, \qquad\qquad x < 2$$

$$= \frac{1}{18}(2x+3) \qquad 2 \leq x \leq 4$$

$$= 0 \qquad\qquad x > 4.$$

Show that it is a density function.
Find the probability that a variable having this density will fall in the interval $2 \leq x \leq 3$.

(b) In a certain factory turning out razor blades, there is a small chance 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 no defective, one defective, and two defective blades respectively in a consignment of 10,000 packets.

(c) A machinist is making engine parts with axle diameter of 0.70 m. A random sample of 10 parts shows mean diameter of 0.742 m with a standard deviation of 0.04 m. On the basis of this sample, would you say that the work is inferior ?

5. (a) There are three bags : first containing   3x5=15

1 white, 2 red, 3 green balls ; second

2 white, 3 red, 1 green balls ; and third

3 white, 1 red, 2 green balls. Two balls are drawn from a bag chosen at random. These are found to be one white and one red. Find the probability that the balls so drawn came from the second bag.

(b) The historical monthly demand for a product is ; January : 80 ; February : 100 ; March : 60 ; April : 80 ; and May : 90.

Using the least squares method, compute a forecast for June, July and August.

(c) The average score of boys in an examination in a college is 71 and that of the girls is 73. The average score of the college is 71.8. Find the ratio of the number of boys to that of the girls that appeared in the examination.