CSI-99

Bachelor in Information Technology (BIT)

Term-End Examination

June, 2008

CSI-99 : STATISTICAL TECHNIQUES

Time : 3 Hours　　　　　　　　　　　　*Maximum Marks : 75*

Note :　Question 1 is **compulsory**. Answer any **three** questions from Q. 2 to Q. 5. Use of calculator is allowed.

1.　(a)　Fill in the blanks :

(i)　The probability that a non-leap year should have 53 Tuesdays is _____ .

(ii)　If A and B are two mutually exclusive events, then $P(A \cup B) =$ _____ .

(iii)　The number of ways in which five people can be lined up to get on a bus is _____ .

(iv)　If $f(x) = kx^3$, $0 < x < 1$ and 0 elsewhere, is a p.d.f., then $k =$ _____ .

(v)　If $P(B) = 0.81$ and $P(A \cap B) = 0.18$, then $P(A/B) =$ _____ .　　　　*5×1=5*

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

(i)　If the mean of a Poisson distribution is 5, then its variance is 10.

(ii)　The mean of a binomial distribution is 5 and standard deviation is 3.

(iii)　The graph of the normal distribution is symmetric with respect to the line $y = x$.

(iv)　The probabilities that an automobile salesperson will sell 0, 1, 2, or 3 cars on any given day in February are respectively 0.19, 0.38, 0.29 and 0.15.

(v)　The correlation coefficient is the geometric mean between the regression coefficients.　　　　*5×1=5*

(c)　Select the correct alternative.

(i)　The median of the numbers

　　　11, 10, 12, 13, 9　is

(A)　12.5

(B)　12

(C)　10.5

(D)　11

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(ii) Average scores of three batsmen A, B, C are respectively 40, 45, and 55 and their standard deviations are respectively 9, 11, 16. Which batsman is more consistent ?

(A) A

(B) B

(C) C

(D) None of them

(iii) 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

(iv) In a Poisson distribution if

$2P(x = 1) = P(x = 2)$, then

the variance is

(A) 0

(B) – 1

(C) 4

(D) 2

(v) If A and B are two events with probabilities P(A) and P(B) then show that

(A) $P(A \cap B) = P(A) \cdot P(B)$

(B) $P(A \cup B) = P(A) + P(B) - P(B/A)$

(C) $P(A \cap B) = P(A) \cdot P(B/A) = P(B) \cdot P(A/B)$

(D) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ 　　　　5×1=5

(d) The random variable X represents the number of automobiles that are used for official business purposes on any given work-day. The probability distribution for company A is

x	1	2	3
f(x)	0·3	0·4	0·3

and for company B is

x	0	1	2	3	4
f(x)	0·2	0·1	0·3	0·3	0·1

Show that the variance of the probability distribution for company B is greater than that of company A. 　　　5

(e) 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 out the correct mean. 　　　5

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(f) Machines A and B produce 10 percent and 7 percent defective units, respectively. The hourly rate of production on machines A and B is 600 and 400 units respectively. One unit is picked up at random and found to be defective. What is the probability that it was produced by machine A ?　　5

2. (a) A committee consists of 9 students, two of which are from 1st year, three from 2nd year and four from 3rd year. Three students are to be removed at random. What is the chance that

    (i) the three students belong to different classes ?

    (ii) two belong to the same class and third to a different class ?

    (iii) the three belong to the same class ?　　5

(b) A can hit a target 3 times in 5 shots, B 2 times in 5 shots, and C 3 times in 4 shots. They fire a volley. What is the probability that

    (i) two shots hit ?

    (ii) at least two shots hit ?　　5

(c) A speaks the truth in 75% cases, and B in 80% of the cases. In what percentage of cases, are they likely to contradict each other in stating the same fact ?　　5

3. (a) Calculate the mean, variance and standard deviation for the following distribution :　　5

Class	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency	3	7	12	15	8	3	2

(b) The demand for a product during the last 10 years is given below. Estimate the demand for the next two years by the method of regression analysis.　　5

Year	1	2	3	4	5	6	7	8	9	10
Units	124	135	145	150	167	157	161	170	187	168

(c) A problem of statistics is given to three students A, B, and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved ?　　5

4. (a) The probability density function of a variate X is

x	0	1	2	3	4	5	6
p(x)	k	3k	5k	7k	9k	11k	13k

    (i) Find $P(X < 4)$, $P(X \geq 5)$, $P(3 < X \leq 6)$

    (ii) What will be the minimum value of k so that $P(X \leq 2) \geq 0.30$?　　5

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(b) The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that

    (i) exactly two will be defective

    (ii) at least two will be defective

    (iii) none will be defective.   5

(c) The heights of soldiers are normally distributed. If 11·51% of the soldiers are taller than 70·4 inches and 9·68% are shorter than 65·4 inches, find the mean and the standard deviation for the data of heights of soldiers.   5

5. (a) A random sample of 100 recorded deaths in India during the past year showed an average life span of 71·8 years. Assuming a population standard deviation of 8·9 years, does this seem to indicate that the mean life span today is greater than 70 years ? Use a 0·05 level of significance.   5

(b) A sample of 8 students majoring in Economics was taken to their IQ scores. They were given a standardised test and their scores were recorded as

     120, 116, 122, 125, 120, 115, 110, 132

Construct a 95% confidence interval for the true average IQ for all majoring in Economics. Assume that the sample is from a Normal distribution.   5

(c) Assume that your stock of sales merchandise is maintained based on the forecast demand. If the distributor's sales personnel call on the first day of each month, compute your forecast sales by each of the two methods mentioned below as (i) and (ii).

	Actual
June	140
July	180
August	170

    (i) Using a simple three-month moving average, what is the forecast for September ?

    (ii) Using a weighted moving average, what is the forecast for September with weights of 0·20, 0·30 and 0·50 for June, July and August, respectively ?   5