M.Com 2nd Semester Examination 2009

ADVANCED BUSINESS STATISTICS

PAPER—CM-1203

Full Marks : 50

Time : 2 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

UNIT—I

1. Answer any *two* questions from the following: 5×2

   (a) In a certain factory turning out blades, there is
   0·2 % probability that any blade can be defective.
   Blades are supplied in packets of 10.

Using Poisson distribution calculate the approximate number of packets containing no defective, 1 defective, 2 defective and 3 defective blades respectively in a consignment of 2000 packets. Given that 5

$$e^{-0.02} = 0.9802.$$

(b) (i) 15,000 students appeared for an examination. The mean marks was 49 and the standard deviation of marks was 6. Assuming the marks to be normally distributed, what proportion of students scored more than 55 marks?

(ii) If in the same examination, Grade 'A' is to be given to the students scoring more than 70 marks what proportion of the students will receive Grade 'A'? 3 + 2

(c) Show that Poisson distribution is the limiting form of the binomial distribution. 5

(d) Distinguish between sampling and non-sampling errors. 5

2. Answer any *one* question: 10×1

   (a) (i) Define simple random sampling. Distinguish between simple random sampling with replacement and simple random sampling without replacement from a finite population.

      (ii) Write short notes on stratified random sampling and multistage sampling.

$$(2 + 3) + (2\frac{1}{2} + 2\frac{1}{2})$$

   (b) (i) Derive mean and variance of binomial distribution.

      (ii) If, on an average, 9 ships out of 10 arrive safely to ports, obtain the probability of safe arrival of exactly two ships out of total 5. $(3 + 3) + 4$

(*Turn Over*)

UNIT—II

3. Answer any *two* questions: 5×2

(a) A random sample of 100 articles taken from a large batch of articles contains 5 defective articles.

Set up 99% confidence limits for the proportion of defective articles in the batch.   5

(b) Time taken by workers in performing a job by Method-I and Method-II is given below:

Method-I: 20   16   26   27   22

Method-II: 27   33   42   35   32   34   38

Do the data reveal that the variances of time of populations from which samples are drawn do not differ significantly ? Test at $\alpha = 0.02$

[Given $F_{0.01;\,(4,\,6)} = 9.15$, $F_{0.01;\,(6,\,4)} = 15.21$].   5

(*Continued*)

(c) Distinguish between: 5

    (i) Null hypothesis and alternative hypothesis

    (ii) Type-I error and Type-II error.

(d) Point out the steps of hypothesis-testing. 5

4. Answer any *one* question: 10×1

    (a) (i) Indian Airlines claims that at most 8% of its lost luggage is never found. A consumer advocacy agency wants to test this claim. In a study of 200 random cases of lost luggage, it was found that in 22 cases, the lost luggage was never found. At 99% confidence level, test the accuracy of the airline's claim.

        (ii) The Vice-Chancellor of Vidyasagar University collected the following data on absenteeism of students of the university by days of the week. The week was selected

at random, when there were no religious or
other reasons for some students to be absent
on any day of that week. The
frequency of absences for each day of the
week is given below:

Day	Number Absent
Monday	120
Tuesday	74
Wednesday	100
Thursday	86
Friday	120

Is there any reason to conclude that there
is a difference in the absence rate by day
of the week? Use $\alpha = 0.05$.

[Given: $\chi^2_{0.05, 4} = 9.488$, $\chi^2_{0.05, 5} = 11.070$].

5 + 5

(b) (i) Briefly explain the maximum likelihood method of estimation.

(ii) What are the properties of a maximum likelihood estimator (M.L.E.)?

(iii) Derive the M.L.E. of the Poisson parameter. $3 + 3 + 4$

[*Internal Assessment* : 10 Marks]

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