



[4369] – 311

Seat No.	
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T.Y. B.Com. Examination, 2013
BUSINESS STATISTICS
(Paper – II)
(2008 Pattern)

Time : 3 Hours

Max. Marks : 80

- N.B. :** i) *All questions are compulsory.*
ii) *Figures to the right indicate full marks.*
iii) *Use of calculator and statistical tables is allowed.*
iv) *Symbols and abbreviations have their usual meanings.*

1. A) Attempt **any four** of the following : **(2 each)**

- a) Define Bernoulli distribution. Also state its mean and variance.
- b) Let X be a Poisson variable with $P[X = 0] = 0.15$. Find mean and variance of X.
- c) If $P(A) = 0.3$, $P(B) = 0.4$ and $P(A/B) = 0.32$, find $P(A \cup B)$.
- d) Find 'n' if ${}^n P_2 = 132$.
- e) Define Lead time and Buffer stock of inventory.
- f) State whether each of the following is true or false :
 - i) $P(\phi) = 0$ is one of the axioms of probability theory.
 - ii) The critical region in χ^2 -test of goodness of fit is always one sided.

B) Attempt **any two** of the following : **(6 each)**

- a) Define independence of two events and mutually exclusive events. Can two events be independent and mutually exclusive simultaneously. Justify your answer with a suitable illustration.
- b) Let X and Y be two independent Binomial variables with parameters (6, 0.4) and (8, 0.4) respectively.

Find :

- i) $P(X + Y = 2)$
- ii) $P(X + Y > 8)$
- iii) Mean of (X + Y) and variance of (X + Y).

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c) A company buys in lots of 500 boxes which is a 3 month supply. The cost per box is Rs. 125 and the ordering cost is Rs. 150. The inventory cost is estimated at 20% of unit value.

- i) What is the total annual cost of the existing inventory policy ?
- ii) How much money could be saved by employing the economic order quantity ?

2. Attempt **any two** of the following :

(8 each)

a) Number of road accidents on a highway during a month follows a Poisson distribution with mean 5. Find the probability that in a certain month, number of accidents on the highway will be

- i) less than 3,
- ii) between 3 and 5,
- iii) more than 3,
- iv) zero.

b) The joint probability distribution of (X, Y) is given below.

X \ Y	0	1	2	3
1	K	3K	5K	2K
2	2K	K	K	K
3	3K	2K	K	K

Obtain :

- i) The value of K.
 - ii) Marginal probability distributions of X and Y
 - iii) $P(Y > 2)$
 - iv) Standard deviation of Y.
- c) Let $X \sim N(0, 1)$. If the events A and B are defined as : $A = \{-0.3 \leq X \leq 0.7\}$ and $B = \{0.1 \leq X \leq 0.3\}$, find (i) $P(A)$ (ii) $P(B)$ (iii) $P(A \cap B)$ (iv) $P(A \cup B)$.



3. Attempt **any two** of the following : **(8 each)**

- a) i) Explain the method of stratified random sampling.
- ii) Define the terms : Estimator, Statistic, sampling distribution of a statistic, standard error of a statistic.

- b) A milk producers' union wishes to test whether the preference pattern of consumers for its products is dependent on income levels. A random sample of 500 individuals gives the following data :

Income	Product Preferred			Total
	Product A	Product B	Product C	
Low	170	30	80	280
Medium	50	25	60	135
High	20	10	55	85
	240	65	195	N = 500

Can you conclude that the preference patterns are independent of income levels ?

- c) i) While conducting population survey of a town, the enumerator noticed that 50% of the male population were illiterate. If the trend continues, work out the probability that out of a random sample of 400 males, the number of illiterates will be
 - i) between 180 and 215
 - ii) less than 185.[Use Normal approximation]

- ii) The arrival rate of customers arriving at a bank counter follows Poisson distribution with a mean of 4 per 10 minutes interval. Find the probability that
 - a) Exactly '0' customers will arrive in a 10 minutes interval
 - b) Atmost 3 customers will arrive in a 10 minutes interval.



4. Attempt **any two** of the following : **(8 each)**

- a) i) In a sample of 8 observations, the sum of squared deviations of items from the mean was 84.4. In another sample of 10 observations, the value was found to be 102.6. Test whether the difference in population variances is significant at 5% level of significance.
- ii) In a certain college, the students are engaged in various sports in the following proportions.
 Football : 60% of all students.
 Basketball : 50% of all students.
 Both Football and Basketball : 30% of all students.
 If a student is selected at random, what is the probability that he will
 i) Play football or basketball ?
 ii) Play neither of the sports ?
- b) i) Explain in brief t-test for test of significance of population correlation coefficient.
- ii) A manufacturer claims that only 5% of his products are unsatisfactory. A random sample of 400 items was inspected and 24 items were found unsatisfactory. Does this justify the manufacturer's claim ? Use 5% level of significance.
- c) i) State the advantages of sampling over census.
- ii) To verify whether a course in accounting improved performance, a similar test was given to 12 participants both before and after the course. The original marks recorded in alphabetical order of the participants were 44, 40, 61, 52, 32, 44, 70, 41, 67, 72, 53, 72. After the course, the marks in the same order were : 53, 38, 69, 57, 46, 39, 73, 48, 73, 74, 60 and 78. Was the course useful ?

5. Attempt **any two** of the following : **(6 each)**

- a) In a survey on the area (in acres) under a crop, 200 villages in a District were divided into 5 strata. The area under the crop in selected villages was noted. The following is the information about the survey :

Stratum No.	Stratum Size (N_i)	Sample Size (n_i)	Area under the crop in the villages selected in sample
1	70	10	16, 15, 14, 12, 8, 11, 12, 10, 13, 16
2	60	7	34, 28, 22, 18, 17, 20, 30
3	35	5	37, 40, 48, 53, 60
4	20	3	62, 74, 53
5	15	2	81, 92

Obtain estimates of (i) each stratum mean (ii) population mean (iii) population total.



- b) A newspaper boy buys papers for 30 paise each and sells them for 70 paise each. He cannot return unsold newspapers. Daily demand of the newspapers has the following probability distribution.

No. of customers	23	24	25	26	27	28	29	30	31	32
Probability	0.01	0.03	0.06	0.10	0.20	0.25	0.15	0.10	0.05	0.05

If each day's demand is independent of the previous day's demand, how many papers should be ordered each day ?

- c) Alpha Industries Limited has deputed four different batches of its employees to four different training organizations (A, B, C and D) for the same training programme, which aims to train them in improving their decision making skills. Each batch consists of five employees with similar qualifications and work experience. After the training programme, the company conducted a common examination to test their level of additional knowledge gained through the training programme. The percentage scores of the employees of the batches in the examination are as follows :

Training Organization			
A	B	C	D
80	70	65	90
90	60	50	89
96	55	58	85
85	85	55	95
70	90	40	80

Perform ANOVA to check whether there is significant difference between the training organizations in terms of improving the decision making skills of the employees at 5% level of significance.
