

2018

M.Com.

2nd Semester Examination

ADVANCED BUSINESS STATISTICS

PAPER—COM-202

Subject Code—03

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Unit - I

(Marks : 20)

1. Answer any *two* questions : 2×5

- (a) Explain the concept of probability distribution. Give two examples of how probability distribution is used in decision making process.

(Turn Over)

- (b) Prove that Poisson distribution is a limiting case of Binomial distribution under certain conditions.
- (c) A brokerage survey reports that 30 per cent of individual investors have used a discount broker, i.e. one which does not charge the full commission. In a random sample of 9 individuals, what is the probability that.
- (i) Exactly two of the sampled individuals have used a discount broker ?
 - (ii) Not more than three have used a discount broker ?
 - (iii) At least three of them have used a discount broker ?
- (d) Explain the method of drawing a stratified sample. State the situation where stratified random sampling is preferred to simple random sampling.

2. Answer any *one* question :

1×10

- (a) (i) The administrator of a large airport is interested in the number of aircraft departure delays that are attributable to inadequate control facilities. A random sample of 10 aircrafts' take-off is to be

thoroughly investigated. If the true proportion of such delays in all departures is 0.04, what is the probability that 4 of the sample departures are delayed because of control inadequacies? Also find the value of the skewness and kurtosis of the distribution and comment on the nature of the distribution. (Given $e^{-10} = 0.00005$, $e^{-4} = 0.0183$, $e^{-0.4} = 0.6703$, $e^{-0.04} = 0.9608$)

- (ii) The income a group of 10,000 persons is found to be normally distributed with mean Rs. 7,500 p.m. and standard deviation Rs. 500. Find the probability that a person will have income exceeding ₹ 8,250, and between ₹ 7,000 — ₹ 8,000. 5+5

(b) (i) What do you mean by 'Standard Error'? How do you distinguish between 'Standard Error' and 'Standard Deviation'?

- (ii) What is non-sampling error or bias? How does it arise in sampling? (2+3)+(2+3)

Unit - II

(Marks : 20)

3. Answer any two questions : 2×5
- (a) Define the criteria of consistency and efficiency of an estimator. 5
- (b) (i) Explain briefly the maximum likelihood estimation method for estimating an unknown parameter. State any four properties of a maximum likelihood estimator. 3+2
- (c) Distinguish between :
- (i) Null hypothesis and Alternative hypothesis.
- (ii) Type-I error and Type-II error. 2½+2½
- (d) The following table shows the recorded temperature (in °C) of Midnapore Town in eight consecutive Sundays in the months of March-April in two years.

Sundays	1	2	3	4	5	6	7	8
Year 2016	37	40	33	32	40	41	44	37
Year 2010	36	34	42	35	33	37	31	40

Would you like to conclude that the average temperature of Midnapore has significantly increased in year 2016 compared to year 2010 ? Test at $\alpha = 0.05$. 5

4. Answer any *one* question :

1×10

(a) (i) What is ANOVA ?

(ii) Appolo Hospital of Chennai operates Gallbladder Stone with the help of Laparoscopy machines. The hospital has three specialist surgeons for operating such patients. A random sample of 18 successful operations of male patients is examined in respect of the time taken (in minutes) by the surgeons to complete the operation and the observation is as follows :

Dr. Gupta	Dr. Roy	Dr. Mehta
35	31	33
39	30	37
32	26	31
28	35	27
27	30	35
--	34	28
--	29	--

Run an ANOVA to test whether the time taken by the surgeons for removing the Gallstone differs significantly. (Test at $\alpha = 0.05$). 2+8

- (b) (i) The Sales Manager of Coca-Cola Company claims that the sales of different beverages (200 ml glass bottle) of the company in Midnapore town are as follows :

Beverages	Thumbs Up	Sprite	Coca-Cola	Limca	Maaza	Total
Percentage of Sales	30	20	25	15	10	100

The collected statistics of the town for the first week of May shows the following sales figure :

Beverages	Thumbs Up	Sprite	Coca-Cola	Limca	Maaza	Total
No. of bottles Sold	3200	1800	2700	1400	900	10000

Do the data support the claim of the Manager ?

Test at $\alpha = 0.05$.

- (ii) The gender distribution of 20 consecutive patients who are admitted at the Emergency Section of Midnapore Hospital is recorded below :

Gender	F	F	F	M	M	M	F	F	M	M	F	M	F	M	F	M	M	M	F	F
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[F = Female, M = Male]

Do the data suggest that the gender distribution of patients admitting at the Emergency Section is random ? Test at $\alpha = 5\%$.

[The critical value of Run test at 5% level for $n_1 = 10$, $n_2 = 10$ are $c_1 = 6$ and $c_2 = 16$ respectively]

6+4

[Internal Assessment — 10 Marks]