



B.COM. Part-III (HONS.)

Sub. : ADVANCE BUSINESS STATISTICS

MODAL PAPER-I

Time Allowed: 3 Hour

Max. Marks: 100

Q1. Answers the following questions each having 2 marks:

- (i) What are the components of a time series?
- (ii) What is meant by Association of Attributes? How is its existence or non-existence determined?
- (iii) What is meant by simple, partial and multi-character correlation?
- (iv) Differentiate between the mutually exclusive and independent events.
- (v) Narrate the main features of binomial probability distribution.
- (vi) Give the chief characteristics of the normal distribution.
- (vii) If a pair of dice is thrown, find the probability that the sum of the digits is neither 7 nor 11.
- (viii) Out of the numbers 1 to 120, one is selected at random. What is the probability that it is divisible by 8 or 10?
- (ix) In how many ways can a vowel and a consonant be selected out of the letters of the word "COURAGE"?
- (x) In how many ways can the letters of the following words be arranged:
 - (a) MATHEMATICS
 - (b) STATISTICS

Q.2 Answers the following questions each having 4 marks:

- (i) How many numbers between 1,000 and 10,000 can be formed from the digits 1,2,3,4,5,6,7? How many of these are divisible by 5?
 - (a) If repetition of the digits is allowed;
 - (b) If repetition of digits is not allowed?
- (ii) In how many ways can 4 men and 3 ladies be arranged at a round table if the 3 ladies,
 - (a) Always sit together.
 - (b) Never sit together?
- (iii) In a randomly selected leap year, what is probability that there are –

- (a) 53 Sundays
- (b) 53 Sundays or 53 Mondays
- (c) 53 Sundays or 53 Fridays, in the year.
- (iv) Write short notes on "Irregular fluctuations" and "Ratio to trend method".
- (v) If $r_{12}=.38$; $r_{13}=.62$ and $r_{23}=.91$;
Calculate $r_{12.3}$; $r_{13.2}$; $r_{23.1}$ and $R_{1.23}$

Q.3 Fit a straight line trend to the following data by the least square method:

Year	:	2008	2009	2010	2011	2012
Values	:	8	10	15	13	14

Or

Use some appropriate interpolation methods and reconstruct the following frequency table with the intervals halved-

X:	0-2	2-4	4-6
F:	35	52	84

Q.4 In an examination at which 500 candidates appeared, boys outnumbered girls by 14% of all candidates. Number of passed candidates exceeded the number of failed candidates by 300. Boys failing in examination numbered 80. Construct the nine square tables and calculate the coefficient of association between boys and success in the examination.

Or

In a normal distribution 2.275% units are below 32 and 15.866% above 44. Find out the mean and standard deviation of the distribution. The table value of Z at p 0.02275 is (-2) and at p 0.15866 is (+1).

Q.5 (i) A random sample of 10 cows was kept on food A for a certain period. This increase in their weights (in kgs) is as under-

10,6,16,17,13,12,8,14,15,9

Another randomly drawn sample of 12 cows was kept on food B for the same period. The increase in their weights (in Kgs) is as under-

7,13,22,15,12,14,18,8,21,23,10,17

Examine the significance of the difference between the increase in weights of cows kept on food A and that of cows kept on food B. (value of 't' for degrees of freedom 20 at 5% level of significance is 2.09.)

(ii) An IQ test was administered to 5 persons before and after they were trained. The results are given below – test whether there is any change in IQ after the training programme;

Candidate	1	2	3	4	5
IQ before training	110	120	123	132	125
IQ after training	120	118	125	136	121

Given : $t_{0.01(4)}=4.6$

Or

Units product by different foundry shops of a plant is as under.

Foundry	units of manufactured product								
A	84	60	40	47	34	-	-	-	
B	67	92	95	40	98	60	59	108	86
C	46	93	100	-	-	-	-	-	

Carry out an analysis of variance of these data.



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Max. Marks: 100

Q.1 Answers the following questions each having 2 marks:

- (i) Explain the term "consistency of qualitative" data.
- (ii) What is multiple regression?
- (iii) Differentiate between the Marginal, Joint and Conditional probability.
- (iv) Three six-faced dice are tossed, what is the probability that the sum of the numbers showing will be 7?
- (v) What do you mean by probability distribution?
- (vi) Give the chief characteristics of poisson distribution.
- (vii) An investment consultant predicts that the odds against the price of a certain stock going up are 2:1 and the odds in favour of the price remaining the same are 1:3. What is the probability that the price of the stock will go down?
- (viii) The probability of a cricket team winning match at Kanpur is $\frac{2}{5}$ and losing match at Delhi is $\frac{1}{7}$. What is the probability of the team winning at least one match?

(ix) Odds are 3:2 in favour of correctly solving a problem of statistics by Sohan, 4:3 by Mohan and 2:1 by Madan. What is the probability that at least two of them would solve the problem correctly?

(x) Two urns A and B contains respectively 2 white and 5 black balls, 3 white and 6 black balls, one ball is transferred from A to B and then a ball is drawn from B. Find the probability that it is a white ball.

Q.2 Answers the following questions each having 4 marks:

(i) Two cards are randomly drawn from a pack of 52 cards and thrown away, what is the probability of drawing an ace in a single draw from the remaining cards?

(ii) If all the permutations of the letters of the word CHALK be written down as in a dictionary, what will be the rank of this word?

(iii) How many 4 letter combinations can be made with the help of the letters of the word STATISTICS? How many 4 letter permutations will be there of this word?

(iv) If the arithmetic mean and variance of a binomial distribution are 1.2 and 0.96 respectively, then find out the distribution.

(v) A manufacturing product has r defects per unit of product inspected. Using Poisson distribution, calculate the probabilities of finding a product without any defect, 3 defects, 4 defects and at the most 3 defects. (Given $e^{-4} = 0.0183$)

Q.3 Given below is the time series data on production (in '000 units) of a certain firm:

Year:	2005	2007	2008	2009	2010	2011	2012
Production	42	49	62	75	92	122	158

('000 units)

(1) Compute the quadratic trend by least squares method.

(2) Forecast the production for the year 2017.

Or

Interpolate the number of candidates who secured second class marks, assuming 48% and 60% are minimum marks for securing second class and first class respectively.

Marks (out of 50)	No. of candidates
0-10	6
10-20	10
20-30	80

30-40	30
40-50	40

Q.4 If the marks obtained by students are normally distributed, 20% students got less than 36 marks and 40% students got less than 50 marks.

(a) Find the mean and standard deviation of the marks.

(b) If 4 students are selected at random, what is probability that exactly 3 out of them will have marks above 75?

Or

(a) At an examination in which 600 candidates appeared the boys outnumbered girls by 16 per cent of all candidates. Number of passed candidates exceeded the number of failed candidates by 310. Boys failing in the examination numbered 88. Construct the two fold association table and calculate the coefficient of association between male sex and success at the examination.

(b) A group of 1000 fathers was studied and it was found that 15% had brown eyes. Among them the ratio of those having sons with brown eyes to those having sons with black eyes was 1 : 1.5. The total number of fathers and sons having black eyes was 800. Find (i) Coefficient of association between brown eyes in father and sons, (ii) Expected frequencies if there is no heredity.

Q.5 (a) Two random samples of size 9 and 7 have mean 196.42 and 198.82 respectively. The sum of squares of deviation from the means is 26.94 and 18.73 respectively. Can the sample be considered to have been drawn from the same population?

(b) Two types of drugs were used on 5 and 7 patients for reducing their weight.

Drug A was imported and drug B indigenous. The decrease in the weight after using the drugs for six months was as follows:

Drug A: 10	12	13	11	14	-	-	
Drug B:	8	9	12	14	15	10	9

Is there a significant difference in the efficacy of the two drugs? If not, which drug should you buy. (for $v = 10$, $t_{0.05} = 2.223$)

Degrees of freedom	13	14	15	16
T at 5% level	2.160	2.145	2.131	2.120
T at 1% level	3.012	2.977	2.947	2.921

Or

The following table gives the number of units of production per day turned –out by four different employees using four different types of machines:

Machines	Types of machines			
	M1	M2	M3	M4
E1	40	36	45	30
E2	38	42	50	41
E3	36	30	48	35
E4	46	47	52	44

- (a) Test the hypothesis that the mean production is the same for the four machines.
- (b) Test the hypothesis that the four employees do not differ with respect to mean productivity.