

M.Com. (CBCS) DEGREE EXAMINATION, APRIL 2021
FIRST SEMESTER
COMMERCE - CORE
ADVANCED BUSINESS STATISTICS
(for those who joined in July 2017 onwards)

Time : Three hours

Maximum: 75 marks

Part - A (10 X 1 = 10 marks)

Answer all question, choose the correct answer:

1. The standard deviation of Binomial distribution is
a. np b. npq c. \sqrt{m} d. \sqrt{npq}
2. Student's t distribution was discovered by
a. Karl Pearson b. Laplace c. Fisher d. Gosset
3. The number of degrees of freedom in a 3×3 contingency table is
a. 8 b. 4 c. 3 d. 1
4. Chi Square value is used for
a. Sign test b. Correlation c. Kruskal-Wallis Test d. Mann-Whitney test
5. In a control chart the upper control limit can be
a. Negative b. Positive c. Neither negative nor positive d. always zero
6. Analysis of variance technique was developed by
a. Rejection of null hypothesis when it is true is known as
a. Standard error b. sampling error c. Type I error d. Type II error
7. The decision involves with probability
a. Hurwicz b. Laplace c. Minimax d. Maximax
8. The fourth moment of Poisson distribution is
a. $m+3m$ b. $3m$ c. m^2+m d. m^2+3
9. The Median value of the normal distribution is 65 and the value of mode is
a. 50 b. 60 c. 65 d. 25
10. Control chart for fraction defective is
a. \bar{X} chart b. P chart c. R chart d. \bar{C} chart

PART-B (5X5=25 Marks)

Answer all Questions, Choosing either (a) or (b) ~~Each answer should not exceed 250 words.~~

11.a. Out of 8000 graduates in a town, 800 are females; out of 1600 graduate employees 120 are female. Use Chi Square to determine if any distinction is made in appointment on the basis of gender. Value of Chi Square for 5% level for one degree of freedom is 3.84.

Or

b. In a normal distribution 12% of the items are under 50 and 85% are under 75. Calculate the mean and standard deviation of the distribution.

12. a. A sample of 150 Air Condition sets is examined to find out the number of defective sets. The details regarding the number of defectives are stated as below.

No. of defects	0	1	2	3	4
No of sets	103	26	15	5	1

Calculate the theoretical distribution on the basis of Poisson distribution technique

Solution: $\bar{X} = 0.5$ (2) $N(P_0) = 90.96$ $N(P_1) = 45.5$ $N(P_2) = 11.4$ $N(P_3) = 1.9$ $N(P_4) = 0.2$ (3)

Or

b. Narrate the chief characteristics of Binomial Distribution

13.a Before an increase in excise duty on tea 400 people out of a sample of 500 persons were found to be tea drinkers. After an increase in the duty, 400 persons were known to be tea drinkers in a sample of 600 people. Do you think that there has been a significant decrease in the consumption of tea after the increase in the excise duty? (Or)

b. Give short notes on Type 1 and Type 2 error

14.a. Intelligence test on two groups of boys and girls gave the following results

	Mean	S.D	N
Girls	75	15	150
Boys	70	20	250

Is there a significant difference in the mean scores obtained by boys and girls?

Or

b. Briefly explain one tail and two tail test

15a. A large hospital hires most of its nurses from the two major universities in the area. Over the last year, they have been giving a test to the newly graduated nurses entering the hospital to determine which school seems to educate its nurses better. Based on the following scores, help the personnel office of the hospital to determine whether the schools differ in quality. Use Mann-Whitney U test at 5% level of significance.

School A	97	69	73	84	76	92	90	88	84	87	93		
School B	88	99	65	69	97	84	85	89	91	90	87	91	72

b. A management is faced with the problem of choosing one of the three products for manufacturing. The potential demand for each product may turn out to be good, fair or poor. The probabilities for each type of demand were estimated as follows.

Type of Demand

Product	Good	Fair	Poor
A	0.75	0.15	0.10
B	0.60	0.30	0.10
C	0.50	0.30	0.20

The estimated profit or loss under the three states of demand in respect of each product may be taken as

Product	Good	Fair	Poor
A	35,000	15,000	5,000
B	50,000	20,000	(-3,000)
C	60,000	30,000	20,000

Advise the management to choose the product for manufacturing out of the three products.
Advise the management about the choice of the product.

PART - C (5X8=40 Marks)

Answer all Questions, Choosing either (a) or (b) Each answer should not exceed 600 words.

16.a Explain the procedure for hypothesis testing Or

b. Ten persons were appointed in a electrical position in an office. Their performance was noted by giving a test and the marks recorded out of 50. They were given six months' training and again they were given a test and marks were recorded out of 50.

Employees	A	B	C	D	E	F	G	H	I	J
Before training	25	20	35	15	42	28	26	44	35	48
After training	26	20	34	13	43	40	29	71	36	46

By applying t test, can it be concluded that the employees have benefitted by the training?

(for $v = 9$, $t_{0.05} = 2.262$)

17.a A sample of 400 items is taken from a normal population whose mean as well as variance is 4. Set up a two way ANOVA table for the following per hectare yield for three varieties of wheat on 3 plots.

Yield Plot of land	A	B	C
I	8	32	20
II	28	36	38
III	6	28	14

Or

b. A sample analysis of examination results of 500 students was made. It was found that 180 students have failed, 170 had secured a third class, 110 were placed in second class and 40 got a first class. Are these figures commensurate with the general examination result which is in the ratio of 4:3:2:1 for the various categories respectively? (Table value of chi square at 5% for df 2, 3 and 4 are 5.99, 7.81 and 9.81 respectively)

18.a. The following are the final examination of marks of three groups of students who were taught computer by three different methods

Method 1	94	88	91	74	87	97	
Method 2	85	82	79	84	61	72	80
Method 3	89	67	72	76	69		

Use H test at 5% level of significance to test the null hypothesis that the three methods are equally effective.

Or

b. In an intelligence test administered to 1000 students the average score was 42 and standard deviation 24. Find a) the number of students exceeding a score of 50 b) the number of students lying between 30 and 54 and c) the value of score exceeded by the top 100 students

19.a. Eight coins are tossed at a time 256 times. Number of heads observed at each throw is recorded and the results are given below. Find the expected frequencies.

No of heads	0	1	2	3	4	5	6	7	8
Frequency	2	6	30	52	67	56	32	10	1

Or

b. Under an employment promotion programme, it is proposed to allow sale of newspapers on the buses during off- peak hours. The vendor can purchase the newspapers at a special concessional rate of 25 paise per copy against the selling price of 40 paise. Any unsold copies are however a dead loss. A vendor has estimated the following probability distribution for the number of copies demanded.

Number of copies	15	16	17	18	19	20
Probability	0.04	0.19	0.33	0.26	0.11	0.07

20.a. the following data provides the values of sample mean and the range for the sample of size 5 each. Calculate the values for central line and control limits for mean chart and range chart and determine whether the process is in control.

No	1	2	3	4	5	6	7	8	9	10
Mean	11.2	11.8	10.8	11.6	11.0	9.6	10.4	9.6	10.6	10.0

Range	7	4	8	5	7	4	8	4	7	9
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(Conversion factor for $m = 5$ are $A_2 = 0.577$, $D_3 = 0$ and $D_4 = 2.115$)

Or

b. A consignment is inspected by the quality control team, as the material is brought in by the vendor to the warehouse. The results are given in the table below (there are samples of 100 items chosen every time the inspection is carried out)

Lot number	1	2	3	4	5	6	7	8	9	10	11	12
Number of defectives	10	12	15	10	12	11	12	13	14	20	15	17

Draw an np chart and p chart with identification of any out of control lot.