Seat No. : _______________

ND-144

December-2015

T.Y.M.B.A. Integrated

Quantitative Techniques

Time : 3 Hours] **[Max. Marks : 100**

Instructions : (1) Graph papers and statistical tables shall be provided on demand.

(2) Non-programmable scientific calculators are allowed.

(3) Answer the questions neatly in sequence.

1. Attempt any **two** : **20**

(a) Describe the following sampling plans : **10**

(i) Systematic Sampling

(ii) Quota Sampling

(b) A population consists of five elements : 2, 3, 4, 6 and 10. Draw all possible samples of size 2 when sampling is done without replacement. Examine whether the sample mean and sample variance are unbiased for the corresponding parameters. What is the sampling variance of mean ? **10**

(c) (i) Suppose that in an attempt to target its clientele, managers of a supermarket chain want to determine the difference between the proportion of morning shoppers who are men and the proportion of after – 5 p.m. Shoppers who are men. Over a period of two weeks the chain's researchers conduct a systematic random sample survey of 400 morning shoppers, which reveals that 352 are women and 48 are men. During this same period, a systematic random sample of 480 after – 5 p.m. Shoppers reveals that 293 are women and 187 are men. Construct a 98% confidence interval to estimate the difference in the population proportions of men. **5**

(ii) Suppose a researcher wants to estimate the average monthly expenditure on bread by a family in Delhi. She wants to be 90% confident of her results. Suppose she wants the estimate to be within ₹ 1.50 of the actual figure and the standard deviation of average monthly bread purchases is ₹ 4.00. What is the sample size estimation for this problem ? **5**

2. Attempt any **two** : **20**

(a) A sample of 80 steel wires produced by factory A yields a mean breaking strength of 1240 pounds with a standard deviation of 120 pounds. Another sample of 100 steel wires produced by factory B, on the other hand, yields a mean breaking strength of 1180 pounds, with a standard deviation of 105 pounds. Can it be concluded that the mean breaking strength of wires produced by factory A is greater than that of factory B ? Test at $\alpha = 0.01$. **10**

(b) In a hypothetical study consumers are asked to rate a company both before and after viewing a video on the company twice a day for a week. The data are displayed in the following table :

Individual	**Before**	**After**
1	32	39
2	11	15
3	21	35
4	17	13
5	30	41
6	38	39
7	14	22

Use the level of significance of 5% to test to determine whether there is a significant increase in the ratings of the company after the one-week video treatment. **10**

(c) The first two samples consisting of 20 pairs of observations gives a correlation of 0.4 while another of 25 pairs has a correlation of 0.5. Are these two correlations significantly different ? **10**

3. Attempt any **two** : **20**

(a) A sample analysis of examination results of 200 MBAs was made. It was found that 46 students had failed, 68 secured a third division, 62 secured a second division and the rest were placed in the first division. Are these figures commensurate with general examination result which is in the ratio of 2 : 3 : 3 : 2 for various categories respectively. Test at 1% level of significance. **10**

(b) Two researchers adopted different sampling techniques while investigating the same group of students to find the number of students falling in different intelligence levels. The results are as follows :

No. of students in each level

Researcher	Below Average	Average	Above Average	Genius
X	86	60	44	10
Y	40	33	25	2

Would you say that the sampling techniques adopted by the two researchers are significantly different ? Test at 5% level of significance. **10**

(c) Previous experience shows the variance of a given process to be 16. Researchers are testing to determine whether this value has changed. They gather the following dozen measurements of the process. Use these data and $\alpha = 0.05$ to test the null hypothesis about the variance. Assume the measurements are normally distributed. **10**

51	45	50	59	47	49
37	48	49	43	54	52

4. The following data represent the number of units of production per day turned out by 5 different workers using 4 different types of machines. **20**

Machine Type

Workers	A	B	C	D
1	44	38	47	36
2	46	40	52	43
3	34	36	44	32
4	43	38	46	33
5	38	42	49	39

(a) Test whether the mean productivity is the same for the different machine types.

(b) Test whether the 5 men differ with respect to the mean productivity.

5. Attempt any **two** : **20**

(a) (i) What are chance and assignable causes of variability ? **5**

(ii) What information is provided by the operating characteristic curve of a control chart ? **5**

(b) A manufacturer produces gauges to measure oil pressure. As part of the company's statistical process control, 25 gauges are randomly selected and tested for non-conformances. The results are shown in the table. Use these data to construct a C-chart that displays the non-conformances per item. **10**

Item Number	**Number of Non-conformances**
1	2
2	0
3	3
4	1
5	2
6	5
7	3
8	2
9	0
10	0
11	4
12	3
13	2
14	2
15	1
16	4
17	0
18	2
19	3
20	2
21	1
22	3
23	2
24	0
25	3

(c) (i) Define : AOQL and LTPD. **5**

(ii) For N = 10,000, n = 89, c = 2 and p = 0.01. Compute AOQ and ATI. **5**