MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

THREE YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF ECONOMICS AND FINANCE

BACHELOR OF ECONOMICS

EES 303: SAMPLE SURVEY

DATE: 29/11/2019 **TIME:2.00-4.00 PM**

INSTRUCTIONS:

- **(i) Answer question one (Compulsory) and any other two questions**
- **(ii) Do not write on the question paper**
- **(iii) Show your working clearly**

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Distinguish clearly between sampling and non-sampling errors, and explain the main sources of non-sampling errors (12 marks)

b) Given two populations of size 95 and 240, use the provided table of random numbers to draw a simple random sample of size 5 and 10 respectively from the populations. Explain the steps followed in each case. (10 marks)

c) A newspaper has 39,800 subscribers served by carrier routes. There is a card for subscribers. In the face of the cards of each carrier route are kept together in a geographical order and neighbouring routes follow each other. The chief purpose of the survey is to find out how many of the subscribers own their homes.

Suppose a systematic sample of n=30 elements of a population result in the following sample represented in the order they were drawn;

9,10,8,9,9,4,5,0,4,7,6,10,4,4,8,9,10,10,7,5,3,2,1,8,9,10,9,8,9,10

Required;

i) Calculate the mean of the sample. (2 marks)

ii) Using both successive and paired selections, compute variance (6 marks)

QUESTION TWO (20 MARKS)

a) Under what circumstances would a stratified random sampling considered appropriate? Using an illustration, explain how you can select such a sample. (6 marks)

b) A sample survey is to be carried out to study the extent of educated unemployed in Machakos sub-county. Describe the important stages of the work. (10 marks)

c) What is the importance of sampling in solving business problems? (4 marks)

QUESTION THREE (20 MARKS)

a) i) An advertising firm wanted to estimate the population mean of households in the country that view show X. The country is divided into three strata, town A, town B and the rural area. The strata contains N1=155, N2=62, and N3=93 households respectively. The advertising firm finds that it costs more to obtain information from a rural household than to obtain a response in town A and B. The increase is due to cost of travelling from one rural household to another. The cost per observation in each town is estimated to be $9 and the cost per observation in the rural area is $16. The stratum standard deviations from prior survey are S1=5,S2=15 and S3=10. Find the overall sample size n and the stratum sample sizes that allow the firm to estimate at minimum cost, the average television viewing time with a bound on the error of estimation equal to 2 hours. (7 marks)

ii) The advertising firm decides to use telephone interview rather than personal interview because all households in the country have telephone and this method reduces costs. The cost of obtaining an observation is then the same in all three strata as in (i) above. The stratum standard deviations are again approximated by S1=5,S2=15 and S3=10. Find the appropriate sample size n and stratum samples taking a bound of 2 (7 marks)

b) Under what circumstances would you consider cluster sampling (6 marks)

QUESTION FOUR (20 MARKS)

a) Identify and clearly explain any five non-probability sampling techniques. (10 marks)

b) State and explain the various methods of Data collection a researcher can use in a survey (10 marks)

QUESTION FIVE (20 MARKS)

a) i) A government park charges admission according to car load rather than by person and a park official wants to estimate the number of persons per car for a particular summer holiday. The officer knows from past experience that there should be 400 cars entering the park and wants to sample 80 cars. To obtain an estimate of the variance, he uses repeated systematic sampling with 10 samples of 8 cars each. Using the data given below, estimate the average number of persons per car and place a bound on the error of estimation. (7 marks)

Data on number of people per car*

Random starting point	Second element	Third element	Fourth element	Fifth element	Sixth element	Seventh element	Eighth element
2(3)	52(4)	102(5)	152(3)	202(6)	252(1)	302(4)	352(4)
5(5)	55(3)	105(4)	155(2)	205(4)	255(2)	305(3)	355(4)
7(2)	57(4)	107(6)	157(2)	207(3)	257(2)	307(1)	357(3)
13(6)	63(4)	113(6)	163(7)	213(2)	263(3)	313(2)	363(7)
26(4)	76(5)	126(7)	176(4)	226(2)	276(6)	326(2)	376(6)
31(7)	81(6)	131(4)	181(4)	231(3)	281(6)	331(7)	381(5)
35(3)	85(3)	135(2)	185(3)	235(6)	285(5)	335(6)	385(8)
40(2)	90(6)	140(2)	190(5)	240(5)	290(4)	340(4)	390(5)
45(2)	95(6)	145(3)	195(6)	245(4)	295(4)	345(5)	395(4)
46(6)	96(5)	146(4)	196(6)	246(3)	296(3)	346(5)	396(3)

*The responses y_i are in parentheses.

ii The management of a large utility company is interested in the average amount of time delinquent bills are overdue. A systematic sample will be drawn from an alphabetical list of N=2500 overdue customer accounts. The standard deviation from a similar study conducted the previous year was S=10. Determine the sample size required to estimate the average amount of time utility bills are overdue with a bound on the error of estimation of 2 days.(assume N=400) (3 marks)

b) Explain the important steps that a researcher must pay attention to when deciding on the best sampling procedure (10 marks)

RANDOM NUMBERS BETWEEN 85 AND 240

91	150	178	110	148	97
149	144	165	124	99	221
186	102	96	201	233	101
231	223	159	185	118	180
172	103	140	172	146	143
124	179	89	180	222	232
93	217	125	209	200	139
160	103	132	198	106	184
203	187	94	93	127	86
167	90	224	232	184	136
144	128	204	94	174	144
141	137	172	169	145	194
229	101	102	194	120	124
173	198	148	100	201	175
106	195	85	145	143	110
125	104	238	174	137	217
117	138	231	117	92	207
89	134	177	235	176	218
177	147	102	221	117	239
141	199	156	106	222	195
239	189	183	231	101	196
90	110	198	196	86	193
173	89	167	117	126	200
186	131	151	122	228	178
126	105	85	100	174	150
172	192	203	184	182	91
129	148	219	113	87	236
158	129	92	191	191	192
171	239	138	197	211	226
214	94	202	109	216	222
183	206	198	122	100	194
168	162	103	123	125	193

Interval Estimate of the Population Mean

$$\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$$

Estimate of the Standard Error of the Mean

$$s_{\bar{x}} = \sqrt{\frac{N-n}{N}}\left(\frac{s}{\sqrt{n}}\right)$$

Interval Estimate of the Population Mean

$$\bar{x} \pm t_{\alpha/2}s_{\bar{x}}$$

Approximate 95% Confidence Interval Estimate of the Population Mean

$$\bar{x} \pm 2s_{\bar{x}}$$

Point Estimator of a Population Total

$$\hat{X} = N\bar{x}$$

Estimate of the Standard Error of $\hat{X}$

$$s_{\hat{X}} = Ns_{\bar{x}}$$

Approximate 95% Confidence Interval Estimate of the Population Total

$$N\bar{x} \pm 2s_{\hat{X}}$$

Sample Size for an Estimate of the Population Mean

$$n = \frac{Ns^2}{N\left(\frac{B^2}{4}\right) + s^2}$$

Sample Size for an Estimate of the Population Total

$$n = \frac{Ns^2}{\left(\frac{B^2}{4N}\right) + s^2}$$

Point Estimator of the Population Mean

$$\overline{x}_{st} = \sum_{h=1}^{H} \left(\frac{N_h}{N}\right)\overline{x}_h$$

Estimate of the Standard Error of the Mean

$$s_{\overline{x}_{st}} = \sqrt{\frac{1}{N^2}\sum_{h=1}^{H} N_h(N_h - n_h)\frac{s_h^2}{n_h}}$$

Approximate 95% Confidence Interval Estimate of the Population Mean

$$\overline{x}_{st} \pm 2s_{\overline{x}_{st}}$$

Point Estimator of the Population Total

$$\hat{X} = N\overline{x}_{st}$$

Estimate of the Standard Error of $\hat{X}$

$$s_{\hat{X}} = N s_{\bar{x}_{st}}$$

Approximate 95% Confidence Interval Estimate of the Population Total

$$N\bar{x}_{st} \pm 2s_{\hat{X}}$$

Allocating the Total Sample n to the Strata: Neyman Allocation

$$n_h = n\left(\frac{N_h s_h}{\sum_{h=1}^{H} N_h s_h}\right)$$

Sample Size when Estimating the Population Mean

$$n = \frac{\left(\sum_{h=1}^{H} N_h s_h\right)^2}{N^2\left(\frac{B^2}{4}\right) + \sum_{h=1}^{H} N_h s_h^2}$$

Sample Size when Estimating the Population Total

$$n = \frac{\left(\sum_{h=1}^{H} N_h s_h\right)^2}{\frac{B^2}{4} + \sum_{h=1}^{H} N_h s_h^2}$$