The Management University of Africa

Sponsored by the Kenya Institute of Management

POSTGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

DOCTOR OF PHILOSOPHY IN MANAGEMENT AND LEADERSHIP

DML 900: ADVANCED STATISTICS

DATE: *7TH DECEMBER 2019*

DURATION: 3 HOURS

MAXIMUM MARKS: 50

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. DO NOT write on this question paper.
3. This paper contains FOUR (4) questions.
4. Question ONE is compulsory.
5. Answer any other TWO questions.
6. Question ONE carries 30 MARKS and the rest carry 10 MARKS each.
7. Write all your answers in the Examination answer booklet provided

QUESTION 1

(a) The statistical results in **table 1(a)** are from a fitted linear regression model whose multiple R-squared was found to be 0.361. Copy and complete **table 1(a)** and interpret the results. **(5 marks)**

Table 1(a): ANOVA TABLE

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	736.322	3	.....	.....	.000
	Residual	.....	.....	.....		
	Total	.....	67			

(b) Describe a test that you can use to test for serial correlations in the residuals of a fitted model. **(4 marks)**

(c) A researcher wanted to find out the distribution of Jobs against years of experience in a certain region in Kenya. The study results are presented in **Figure (1c)**.

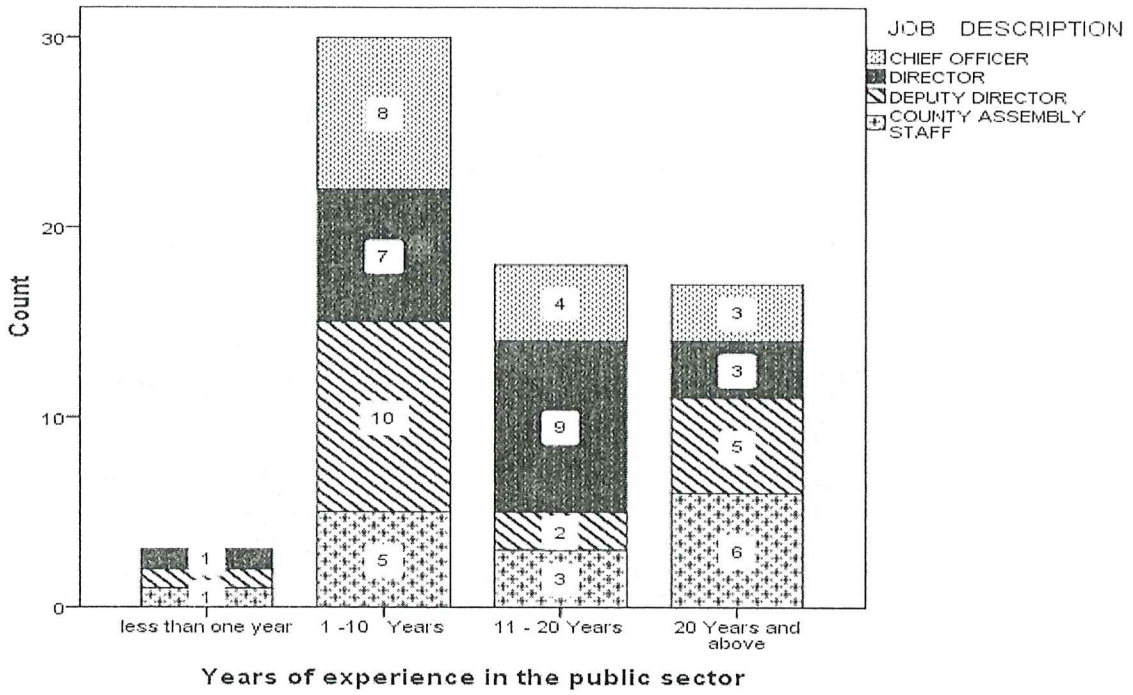

Figure (1c): Years of experience in the public sector Versus Job Description

Table 1(c): Cross Tabulation for JOB DESCRIPTION and Years of experience in the public sector

			Years of experience in the public sector				
			less than one year	1 -10 Years	11 - 20 Years	20 Years and above	Total
JOB DESCRIPTION	CHIEF OFFICER	Count	.....	.....	.....	.....	.....
		% within JOB DESCRIPTION	.....	.....	.....	.....	.....
		% within Years of experience in the public sector	.....	.....	.....	.....	.....
	DIRECTOR	Count	.....	.....	.....	.....	.....
		% within JOB DESCRIPTION	.....	.....	.....	.....	.....
		% within Years of experience in the public sector	.....	.....	.....	.....	.....
	DEPUTY DIRECTOR	Count	.....	.....	.....	.....	.....
		% within JOB DESCRIPTION	.....	.....	.....	.....	.....
		% within Years of experience in the public sector	.....	.....	.....	.....	.....
	COUNTY ASSEMBLY STAFF	Count	.....	.....	.....	.....	.....
		% within JOB DESCRIPTION	.....	.....	.....	.....	.....
		% within Years of experience in the public sector	.....	.....	.....	.....	.....
Total		Count	.....	.....	.....	.....	.....

	% within JOB DESCRIPTION	.....	.....	.....	.....	.....
	% within Years of experience in the public sector	.....	.....	.....	.....	.....

(i) Copy and complete **table 1(c).** **(8 marks)**

(ii) Discuss any two key findings from **figure 1(c)** **(2 marks)**

(d) Suppose that for a sample of 36 Family Nurse Practitioners (FNP's) From several similar type hospital clinics, a competency score ranging from 0 to 100 was derived based on performance at the clinic. Suppose further that the sample mean competency score for all FNP's was 80 and the sample variance was 100. Compute the 95% confidence interval for the true mean of the competency score.

(4 marks)

(e) The height of male college students has a normal distribution with mean 71 inches and standard deviation 3 inches. If 100 male college students are selected at random, how many students will have a height of between 70.5 and 73 inches? **(4 marks)**

(f) The observed variance for the 100 measurements of gear diameter is 0.00003969. Test the null hypothesis that the true variance is equal to 0.01 against the alternative that the true variance is greater than 0.01 at 5% level of significance. **(3 marks)**

QUESTION 2

(a) A plant manager for ABC Company has a good, stable workforce of semi-skilled workers who package floss, and are paid by piecework. The company wants to make sure that these workers are paid more than the local average wage. A recent report by the local Chamber of Commerce shows an average wage for machine operators of $11.71 per hour. The manager must decide if a raise is needed to keep her workers above the average. She takes a sample of workers, pulls their work reports, finds what

each one earned last week, and divides their earnings by the hours they worked to find average hourly earnings. The data appear in **Table 2(a).**

Table 2(a): Sample of Hourly Wage Paid at ABC company

Worker	Wage (dollars/hour)
Smith	12.65
Wilson	12.67
Peterson	11.9
Jones	10.45
Gordon	13.5
McCoy	12.95
Bland	11.77

Should the manager raise the wage at 5% level of significance? **(5 marks)**

(b) In a large restaurant, an average of 3 out of every 5 customers asks for water with their meal. A random sample of 10 customers is selected. Find the probability that:

(i) Exactly 6 customers ask for water with their meal. **(2 marks)**

(ii) More than 7 customers ask for water with their meal. **(3 marks)**

QUESTION 3

(a) The statistical results in **table (3)** are from a fitted linear regression model.

(i) Copy and complete **table 3(a).** **(4 marks)**

(ii) Interpret the column labeled Beta. **(1 mark)**

(iii) Write down the fitted model. **(1 mark)**

Table 3: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.....	2.254		1.735	.088		
	INTRA PERSONAL TRAITS	.099	.....	.109	.856	.395	.618	.....
	OPERATIONAL MINDSET	.234	.131	.256	.....	.079	.487	2.053
	INTER PERSONAL TRAITS	.294	.....	.322	2.317	.024	.....	1.935

a. Dependent Variable: SERVICE DELIVERY

(b) The number of houses sold by an estate agent follows a Poisson distribution, with a mean of 2 per week. Find the probability that in the next 2 weeks the estate agent will sell:

(i) Exactly 3 houses **(2 marks)**

(ii) More than 5 houses **(3 marks)**

QUESTION 4

(a) A survey was done on the job descriptions of top officials of a 4 counties. The findings are as summarized in the **Table 4(a):**

Table 4(a): Cross Tabulation for Job Description and Body

			Body		
			County government	County Assembly	Total
JOB DESCRIPTION	CHIEF OFFICER	Count	.....	1	15
		% within JOB DESCRIPTION	93.3%	6.7%	100.0%
		% within Body	.....	25.0%	22.1%
	DIRECTOR	Count	18	2	20
		% within JOB DESCRIPTION	90.0%	.....	100.0%
		% within Body	28.1%	.....	29.4%
	DEPUTY DIRECTOR	Count	18	0	18
		% within JOB DESCRIPTION	100.0%	.0%	100.0%
		% within Body	28.1%	.0%	.....
	COUNTY ASSEMBLY STAFF	Count	14	1	15
		% within JOB DESCRIPTION	.....	6.7%	100.0%
		% within Body	21.9%	.....	22.1%
Total		Count	.....	.....	.....
		% within JOB DESCRIPTION	.....	.....	.....
		% within Body	.....	.....	.....

(iii) Copy and complete **table 4(a).** **(4 marks)**

(iv) Discuss any one key finding from **table 4(a).** **(1 mark)**

(b) Liz, a young banker, has moved from Town A to Town B where she has recently been promoted and made the manager of County Sacco Society, a newly established SACCO in county X with branches across the county. After a few weeks, she has discovered that maintaining the correct number of tellers seems to be more difficult than it was when she was a branch assistant manager in Town A. Some days, the lines are very long, but on other days, the tellers seem to have little to do. She wonders if the number of customers at her new branch is simply more variable than the number of customers at the branch where she used to work. She collects the following data on the number of transactions in a day from her branch and the branch where she used to work:

Town A branch: 156, 278, 134, 202, 236, 198, 187, 199, 143, 165, 223

Town B branch: 345, 332, 309, 367, 388, 312, 355, 363, 381

Test whether the two branches have significant difference in the variations of the number of customers at 5% level of significance. **(5 marks)**

Critical Values of the Durbin-Watson Statistic

		K = Number of Regressors							
		1		2		3		4	
Sample Size	Significance Level	dL	dU	dL	dU	dL dU		dL dU	
Size									
15	0.01	.81	1.07	.70	1.25	.59	1.46	.49 1.70	
	0.025	.95	1.23	.83	1.40	.71	1.61	.59	1.84
	0.05	1.08	1.36	.95	1.54	.82	1.75	.69	1.97
20	0.01	.95	1.15	.86	1.27	.77	1.41	.63	1.57
	0.025	1.08	1.28	.99	1.41	.89	1.55	.79	1.70
	0.05	1.20	1.41	1.10	1.54	1.00	1.68	.90	1.83