



MACHAKOS UNIVERSITY

University Examinations 2021/2022 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ADMINISTRATION

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

DOCTOR OF PHILOSOPHY IN BUSINESS

BMS 900: STATISTICS FOR BUSINESS

DATE: 17/12/2021

TIME: 9.00-12.00 PM

INSTRUCTIONS

Answer Question ONE and any other THREE questions

QUESTION ONE (COMPULSORY) (15 MARKS)

- a) A human resource manager wanted to determine if the mean marks awarded to candidates by various panelists during an oral interview were the same. She collected a random sample of candidates and the scores awarded to them by the panelists. The data obtained was recorded in the table below.

Candidate/Panelist	Panelist A	Panelist B	Panelist C
Ann	40	48	40
John	56	55	65
Emma	78	78	70
Juma	60	68	59
Zena	85	80	90

Perform the Kruskal Wallis test at the 5% level to determine if the mean scores awarded were equal. (3 marks)

- b) The KCSE mean score for students in a certain extra-county school in Machakos was 9.60 with standard deviation of 0.36 during a certain year. The principal was of the opinion that the selection of all the three science subjects instead of a minimum of two had an effect on the performance. A sample of 36 students who had taken all the three science subjects had a mean score of 8.92. Test the hypothesis that selection of the three science subjects had a significant effect at 5%. (3 marks)

- d) A researcher sought to determine the patterns of households' savings. He sampled ten households and recorded their data on monthly incomes and savings in thousands of Kenya Shillings as follows.

Households	A	B	C	D	E	F	G	H	I	J
Incomes	10	25	20	16	13	23	18	12	27	22
Savings	3	15	10	7	4	12	5	6	13	11

- a) Estimate and interpret a savings model for the households. (2 marks)
- b) Evaluate the statistical significance of the model. (1 mark)
- e) A mobile phone company would like to introduce a product in a foreign country. The sales experts have advised the company that the product would be profitable if it attracts at least 30% subscription in the market. The company engaged the research department to conduct a study to test the product in the market. During the study, 200 potential clients were sampled out of whom 50 indicated that they would subscribe to the product. Carry out a hypothesis test at 5% level of significance and advise whether the product should be introduced. (3 marks)
- f) A light bulb manufacturing company produces bulbs at two factories located at different parts of the country. Every effort is made to maintain uniformity of the mean life spans of the bulbs being produced by the two factories. To determine if the two factories are maintaining uniformity of production, the manufacturer selects a sample of 50 specimens from factory 1 and 30 from factory 2. The mean life spans of the samples are 24 and 20 weeks for factory 1 and factory 2 respectively. The variances for the life spans for factory 1 and 2 are 10 and 9 weeks respectively. The populations are normally distributed.
- Construct 95% confidence interval estimate for the difference between the two means and comment on the uniformity (3 marks)

QUESTION TWO (15 MARKS)

- a) A postgraduate student sought to investigate whether there was a relationship between households' income levels and the regions they hailed from. She conducted a household survey and obtained the following data.

Region

Income class / Region	Urban	Semi-urban	Rural
Low-income class	400	300	200
Middle-income class	200	200	200
High-income class	300	100	100

Carry out the relevant statistical test at 1%. (10 marks)

- b) The credit department of certain commercial bank wanted to confirm whether customers who got the same credit facilities to invest in their small and medium enterprises in different regions made any statistically different returns from their investments. The research department sampled ten customers from four regions and observed their monthly mean returns. Anova test was conducted on SPSS and the following results were obtained.

Sales

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	85.745	5	17.149	0.002	.028
Within Groups	6486.424	94	69.004		
Total	6572.169	99			

Interpret the above Anova results (5 marks)

QUESTION THREE (15 MARKS)

A real estate firm is interested in developing off campus hostels for students attending universities and colleges in Machakos town. As a researcher you are contracted to conduct a market study and estimate an appropriate econometric model to determine factors that influence students' choices for off campus hostels.

- a) Discuss the steps that you should follow to develop this econometric model using a suitable economic theory (10 marks)
- b) Explain five ways you can use to examine the validity of the econometric model (5 marks)

QUESTION FOUR (15 MARKS)

A medical researcher tested to find out if a new drug lowered total cholesterol. He designed a randomized controlled trial to evaluate the efficacy of the medication in lowering cholesterol. Thirty participants were enrolled in the trial and were randomly assigned to receive either the new drug or a placebo. The participants did not know which treatment they were assigned. Each participant was asked to take the assigned treatment for 4 weeks. At the end of 4 weeks, each participant's total cholesterol level was measured and the sample statistics were as follows.

Treatment	Sample size	Mean	Standard Deviation
New Drug	15	194.8	26.4
Placebo	15	218.2	28.6

- a) Show whether there was statistical evidence of a reduction in mean total cholesterol in participants who took the new drug for 4 weeks as compared to those who took placebo (10 marks)
- b) Explain possible limitations of the test above (5 marks)

QUESTION FIVE (15 MARKS)

- a) The managing director of a commercial bank wanted to find out if monthly profits generated by different regions were significantly different. He sampled five branches from each of the four regions. Their annual profits in millions of US dollars were recorded as follows in the table below.

Northern Region	Eastern Region	Western Region	Southern Region
80	83	83	84
78	87	76	76
80	75	79	80
66	65	66	62
56	60	61	58

- Perform ANOVA test at 1% level to determine whether the mean annual profits for the regions were equal. (8 marks)
- c) A research firm conducted a study to determine the influence of several variables on poverty of developing countries. The variables were expressed as follows: corruption index, gross domestic product (gdp), external debt, inflation, lending interest rate (interest_rate) and political instability (instability). Eight countries were sampled to represent the developing countries. Dummy variables (d_i) for each country were also generated. A regression analysis was conducted using STATA and the following results were generated.

reg poverty corruption gdp externaldebt inflation interest_rate instability d1 d2 d3 d4
d5 d6 d7

Source	SS	df	MS			
Model	1235.82438	13	95.0634139	Number of obs =	120	
Residual	373.6126	106	3.52464717	F(13, 106) =	26.97	
Total	1609.43698	119	13.5246805	Prob > F	= 0.0000	
				R-squared	= 0.7679	
				Adj R-squared	= 0.7394	
				Root MSE	= 1.8774	

poverty	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
corruption	.0379068	.0186085	2.04	0.044	.0010137	.0747999
gdp	.0336	.0495217	0.68	0.499	-.0645817	.1317816
externaldebt	-.0112656	.0053895	-2.09	0.039	-.0219507	-.0005805
inflation	-.0494743	.0279642	-1.77	0.080	-.1049161	.0059674
interest_r-e	.2281789	.0391883	5.82	0.000	.1504842	.3058736
instability	.1684454	.0384648	4.38	0.000	.0921852	.2447057
d1	2.096697	.8511876	2.46	0.015	.4091354	3.78426
d2	-3.540151	.7682881	-4.61	0.000	-5.063357	-2.016946
d3	-2.25814	.9166219	-2.46	0.015	-4.075432	-.4408485
d4	-6.388576	1.515923	-4.21	0.000	-9.394041	-3.38311
d5	-1.72165	.7115396	-2.42	0.017	-3.132347	-.3109537
d6	.5714361	2.441445	0.23	0.815	-4.268966	5.411838
d7	-.2913584	.7060969	-0.41	0.681	-1.691264	1.108547
_cons	-2.363246	1.124113	-2.10	0.038	-4.591908	-.1345828

Interpret the regression results above and give two policy recommendations (7 marks)