

Time allowed: 2 hrs 30 min

Max Marks: 50

Roll No: _____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means**. In case of rough work please use answer sheet.

Sections	No. of Questions to attempt	Marks	Marks
A	3 out of 5(Short Questions)	5 marks each	3*5 = 15
B	2 out of 3 (Long Questions)	10 marks each	2*10= 20
C	Compulsory Case Study	15 marks	15
		Total Marks	50

Section A

- A1. How can you study Business research methods in a systematic manner? Explain your answer by presenting a roadmap to learn Business research methods?
- A2. Discuss the concept of a two-tailed test in hypothesis testing. When should we consider a one-tailed test for hypothesis testing?
- A3. Welcome Inc. is a chain of fast-food restaurants located in major metropolitan areas in the south. Sales have been growing very slowly for the last two years. Management has decided to add some new items to the menu, but first they want to know more about their customers and their preferences. What kind of research design is appropriate? Why?
- A4. Explain briefly with proper examples:
 - a) Descriptive and Inferential Analysis
 - b) Inductive and deductive reasoning
- A5. What are internal and external validity in experimentation? How can a researcher control the threats to internal and external validity in an experiment?

Section B

An industry analyst would like to predict automobile sales from a set of predictors. The data file contains 154 observation, data fields (variables) used are:

Sl.	Variable	Description	Type
1	manufact	Manufacturer	String
2	model	Model	String
3	sales	Sales in thousands	Numeric
4	resale	4-year resale value	Numeric
5	type	Vehicle type	String
6	price	Price in thousands	Numeric
7	engine_s	Engine size	Numeric
8	horsepow	Horsepower	Numeric
9	wheelbas	Wheelbase	Numeric
10	width	Width	Numeric
11	length	Length	Numeric
12	curb_wgt	Curb weight	Numeric
13	fuel_cap	Fuel capacity	Numeric
14	mpg	Fuel efficiency	Numeric

B1. Many of the predictors are correlated and the analyst fears that this might adversely affect her results. She uses Factor Analysis with Principal Axis Factoring extraction to focus the analysis on a manageable subset of the predictors.

Communalities

	Initial	Extraction
Sales in thousands	.319	.213
4-year resale value	.947	.854
Price in thousands	.961	.931
Engine size	.873	.763
Horsepower	.913	.848
Wheelbase	.844	.822
Width	.702	.698
Length	.838	.714
Curb weight	.890	.856
Fuel capacity	.816	.699
Fuel efficiency	.784	.649

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.030	54.817	54.817	5.806	52.778	52.778	4.591	41.734	41.734
2	2.483	22.569	77.386	2.243	20.388	73.166	3.458	31.432	73.166
3	.745	6.776	84.162						
4	.634	5.764	89.926						
5	.429	3.896	93.822						
6	.252	2.294	96.116						
7	.140	1.270	97.386						
8	.124	1.131	98.517						
9	.088	.800	99.317						
10	.053	.481	99.798						
11	.022	.202	100.000						

Extraction Method: Principal Axis Factoring.

Rotated Factor Matrix^a

	Factor	
	1	2
Wheelbase	.896	
Length	.845	
Curb weight	.835	.399
Width	.812	
Fuel capacity	.776	.311
Fuel efficiency	-.671	-.446
Engine size	.620	.616
Price in thousands		.952
4-year resale value		.924
Horsepower	.387	.836
Sales in thousands	.324	-.328

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

SPSS output are here for your reference, answer the following:

- How is factor analysis different from multiple regression.
- Define briefly: communality of a variable and eigen value
- Suggest the surrogate variables from the given set of variables? How are they determined?
- What is the purpose of "varimax" rotation, used in this procedure?

B.2 Further the analyst, calculated the following

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Fuel capacity	17.958	154	3.9125	.3153
	Fuel efficiency	23.84	154	4.283	.345

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Fuel capacity & Fuel efficiency	154	-.802	.000

Paired Samples Test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Fuel capacity - Fuel efficiency	-5.8657	7.7790	.6268	-7.1241	-4.6473	-9.389	153	.000

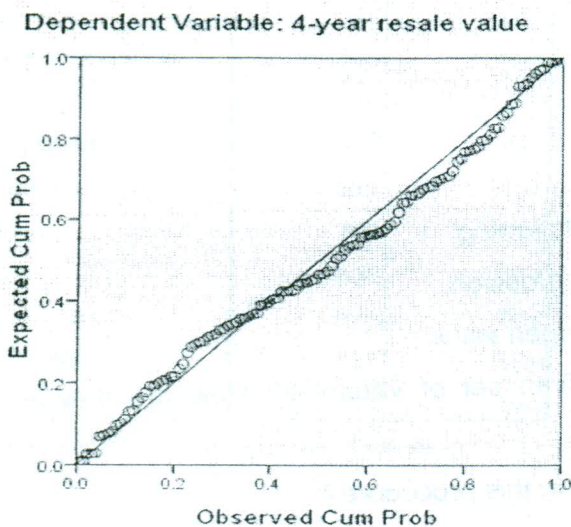
- State and interpret the hypothesis for paired sample correlation.
- State and interpret the hypothesis for paired sample test.
- What is the relevance of Levene's Test in t-test and F-test
- In case analyst wants to test the significant difference in sales of the automobile for different models, she should use which parametric test and why?

B3. Following are the SPSS regression outputs, comment on the regression model.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.970 ^a	.940	.938	2.882328

a. Predictors: (Constant), Price in thousands, Length, Fuel efficiency, Curb weight



ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14693.646	4	3673.411	442.163	.000 ^a
	Residual	930.475	112	8.308		
	Total	15624.121	116			

a. Predictors: (Constant), Price in thousands, Length, Fuel efficiency, Curb weight

b. Dependent Variable: 4-year resale value

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics		
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF	
1	(Constant)	27.105	5.634		4.811	.000						
	Length	-.070	.028	-.083	-2.486	.014	.025	-.229	-.057	.474	2.111	
	Curb weight	-3.447	1.032	-.177	-3.341	.001	.363	-.301	-.077	.189	5.300	
	Fuel efficiency	-.254	.109	-.096	-2.328	.022	-.399	-.215	-.054	.311	3.216	
	Price in thousands	.832	.023	1.014	36.349	.000	.955	.960	.838	.683	1.465	

a. Dependent Variable: 4-year resale value

- Is the model statistically significant, comment with proper explanation?
- Interpret R, R Square and Adjusted R Square.
- Interpret P-P Plot of Regression Standardized Residual
- Would you expect multicollinearity among the independents? Why or why not? What does the "Tolerance" score in the collinearity statistics indicate?

SECTION C

The recent boom in the organized retail industry in India has increased the need of appropriate research. Most department store chains carry out a number of in-store promotions in order to ensure that they keep ahead of competition. ABC Ltd. Wants to examine the effect of the level of in-store promotions and a store wide coupons on sale. In-house promotions are varied at different levels: high, medium and low. Couponing is manipulated at two levels: either a coupon of Rs 500 is distributed to potential shoppers (denoted as Yes) or not (denoted as No).

The company wants to determine the effect on in store promotion on sales.

In light of the above situation answer the following. (Each ques. carries 2.5 marks)

- Define the Management Decision Problem and the Researcher's Problem respectively.
- What type of research should be conducted by management to come up with a decision? Justify your answer.

In-store promotion and couponing were crossed, resulting in a 3 X 2 design with six cells. Thirty stores were randomly selected, and five stores were randomly assigned to each treatment condition. The experiment was run for two months. Sales in each store were measured, normalized to account for extraneous factors (store size, traffic, etc.) and converted to a 1-to-10 scale. Now the store wants to examine the effect of the level of in store promotion and couponing on store sales. Interpret the following ANOVA table:

Tests of Between-Subjects Effects

Dependent Variable: Sales

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	162.667 ^a	5	32.533	33.655	.000
Intercept	1104.133	1	1104.133	1.142E3	.000
Coupon	53.333	1	53.333	55.172	.000
promotion	106.067	2	53.033	54.862	.000
coupon * promotion	3.267	2	1.633	1.690	.206
Error	23.200	24	.967		
Total	1290.000	30			
Corrected Total	185.867	29			

a. R Squared = .875 (Adjusted R Squared = .849)

Multiple Comparisons

Sales

Tukey HSD

(I) In-Store Promotion	(J) In-Store Promotion	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
High	Medium	2.10	.440	.000	1.00	3.20
	Low	4.60	.440	.000	3.50	5.70
Medium	High	-2.10	.440	.000	-3.20	-1.00
	Low	2.50	.440	.000	1.40	3.60
Low	High	-4.60	.440	.000	-5.70	-3.50
	Medium	-2.50	.440	.000	-3.60	-1.40

(Each ques. carries 5 marks)

- c) Formulate all possible hypotheses for univariate ANOVA and infer conclusions.
- d) Formulate hypotheses for multiple comparisons test and infer conclusions.