PGDM-RM 2013 - 15
Research Methodology
RM-306
Trimester – III, End-Term Examination: April 2014

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.

Section A

Attempt ANY three questions in this section. Each question carries 5 marks. (3 x 5)

A1. Do you agree with the statement "research is much concerned with proper facts, finding, analysis and evaluations", justify your answer with suitable reasons.

A2. Explain Research Design and essentials of a good research design. Develop a Retail Industry specific Research plan (in points need not elaborate).

A3. Explain Sampling Method and why is sampling so important for a researcher? Cite the types of probability and non-probability sampling techniques.

A4. Whereas validity presupposes reliability, reliability does not presuppose validity.Explain

A5. Write short notes (In 100 words each):

a) Sampling and Non sampling Errors

b) Hypothesis Testing

Section B

Attempt ANY two questions in this section. Each question carries 10 marks. *(2 x 10)*

Data Description

The data file contains 200 observation from a sample of high school students with demographic information about the students. It also contains a number of scores on standardized tests including test of reading, writing, mathematics and social studies. The data fields (variables) used are:

Sl.	*Variable*	*Description*	*Value Range*
1	id	Student's id No.	
2	gender		1 FEMALE 2 MALE
3	race	ethnic background	1 HISPANIC 2 ASIAN 3 AFRICAN-AMER 4 WHITE
4	ses	socio-economic status	1 LOW 2 MIDDLE 3 HIGH
5	schtyp	type of school	1 PUBLIC 2 PRIVATE
6	prog	type of program	1 GENERAL 2 ACADEMIC 3 VOCATION
7	read	reading score	0 to 100
8	write	writing score	0 to 100
9	math	math score	0 to 100
10	science	science score	0 to 100
11	socst	social studies score	0 to 100

B.1 Based on the following SPSS output table, answer the following :

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
writing score	female	109	54.9908	8.13372	.77907
	male	91	50.1209	10.30516	1.08027

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
writing score	Equal variances assumed	11.133	.001	-3.734	198	.000	-4.8699	1.30419	-7.44183	-2.29806
	Equal variances not assumed			-3.656	169.707	.000	-4.8699	1.33189	-7.49916	-2.24073

(i). State the null and alternative hypothesis.

(ii). What is the relevance of Levene's Test, frame hypothesis for Levene's test.

(iii). Interpret the conclusion

(iv). If you have to find whether females differ in their reading and writing skills, you will utilize which parametric test.

B 2. Using the subject scores (fields 7 to 11), a factor analysis was conducted. Comment , in details, on the Factor Analysis using the SPSS output provided.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.861
Bartlett's Test of Sphericity	Approx. Chi-Square	492.437
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
reading score	1.000	.736
writing score	1.000	.704
math score	1.000	.750

science score	1.000	.849
social studies score	1.000	.900

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	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	3.381	67.616	67.616	3.381	67.616	67.616	2.113	42.267	42.267
2	.557	11.148	78.764	.557	11.148	78.764	1.825	36.497	78.764
3	.407	8.136	86.900						
4	.356	7.123	94.023						
5	.299	5.977	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
reading score	.650	.559
writing score	.508	.667
math score	.757	.421
science score	.900	.198
social studies score	.222	.922

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

(i). What is the research objective behind this "Factor Analysis"? What would the extracted "factors" denote – and how does this exercise provide a means of dimensionality reduction"?

(ii). What interpretation you will draw from Bartlett's test of sphericity?

(iii). If factor has been extracted for eigen value > 1, how many factors have been extracted.

(iv). From the "Total Variance Explained" exhibit, draw a scree plot.

B 3. Based on some of the SPSS regression outputs shown here, comment on the regression model. Use the following bullet points to structure your response.

(i). What is the value of the coefficient of determination. Interpret its meaning.

(ii). What the test statistics "Durbin Watson" is used to detect for.

(iii). Frame the hypothesis for ANOVA table

(iv). Which IV's are not making a significant change in DV, explain how you concluded.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.776[a]	.602	.591	6.05897	.602	58.603	5	194	.000	2.000

a. Predictors: (Constant), social studies score, Gender, science score, math score, reading score

b. Dependent Variable: writing score

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10756.924	5	2151.385	58.603	.000[a]
	Residual	7121.951	194	36.711		
	Total	17878.875	199			

a. Predictors: (Constant), social studies score, Gender, science score, math score, reading score

b. Dependent Variable: writing score

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	6.139	2.808		2.186	.030		
Gender	5.493	.875	.289	6.274	.000	.966	1.035
reading score	.125	.065	.136	1.931	.055	.416	2.405
math score	.238	.067	.235	3.547	.000	.466	2.144
science score	.242	.061	.253	3.986	.000	.511	1.958
social studies score	.229	.053	.260	4.339	.000	.573	1.744

a. Dependent Variable: writing score

SECTION C

This section is compulsory and carries 15 marks. (1 x 15)

C 1. Case Study: Checking Out Checkout

Three checkout lines at a supermarket use three different scanner systems that read the UPC symbols on the products and find the prices. The store manager suspects that the three scanner systems have different efficiencies and want to check their speeds. He measures at randomly selected times the speed of each system in number of items scanned per minute. The measurements are given in the table below. Assume normal distribution with equal variance for the three systems.

Scan 1	Scan 2	Scan 3
16	13	18
15	18	19
12	13	15
15	15	14
16	18	19
15	14	16

15	15	17
14	15	14
12	14	15
14	16	17

The ANOVA table for the above experiment is given below:

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	20.6				0.044887	3.354131
Within Groups						
Total	100.3					

Formulate hypotheses and infer conclusions.(Marks 4)

After studying the test results, a representative of the manufacturer of one of the three scanner systems remarks that the ANOVA results may be affected by the differing skills of the checkout clerks. The clerks were not the same for all measurements.

Wanting to know the difference in the efficiencies of the clerks as well as the systems, the manager redesigns the experiment to yield measurements for all the combinations of five clerks and three systems. The measurements from this experiment are tabulated below. Assume normal distribution with equal variance for all cells.

	Scan 1	Scan 2	Scan 3
Clerk 1	15	16	18
	15	17	17
	14	14	15
	15	12	15
Clerk2	14	15	14
	15	17	18
	13	16	19

	12	13	20
Clerk 3	15	16	17
	14	14	18
	16	13	17
	13	14	16
Clerk 4	14	15	20
	15	17	19
	16	18	17
	15	14	16
Clerk 5	15	16	20
	17	16	18
	14	17	18
	13	19	17

ANOVA (without replication)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows		19	3.066667		0.213	1.867332
Columns	90.7				.000	3.244818
Error	86.63333					
Total	235.6	59				

Formulate hypotheses for this stage and draw conclusions. (Marks 4)

ANOVA (with replication)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	20.76667				0.093	2.578739
Columns					.000	3.204317
Interaction	14.13333				0.670	2.152133
Within	110					
Total	235.6	59				

Formulate hypotheses for this stage and draw conclusions. (Marks 4)

After observing the ANOVA tables, you would recommend ANOVA with or without replication. Justify your answer(3 Marks)