PGDM 2013 - 15
Research Methodology
Subject Code- DM-207
Trimester – II, End-Term Examination: December 2013

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)*

Q A1 For each situation, decide whether the marketing research should be exploratory, descriptive, or experimental; justify your answer:

  a. How can the performance of three major international courier companies be judged?

  b. *Who buys our microwave ovens?*

  c. *Among middle class families in Delhi and Agra is there a difference in average monthly expenditure incurred on regular food items?*

Q A2 Identify process steps for conducting a marketing research. Highlight the measures that need to be taken at each step to minimize errors.

Q A3 Why is 'Review of literature' included in a research report? What is its purpose?

Q A4 Under what conditions are observation studies most appropriate? What are the advantages and disadvantages of observation studies compared to survey?

Q A5 For a marketing research explain 'Validity' and 'Reliability'.

Section B

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

Data Description
The data used for this section is the first trimester result for 219 students of 2013-15 batch admitted to the PGDM program. The data fields (variables) used are:

Sl.	Variable	Description	Value Range
1	rollno	Student's Roll No.	
2	name	Name of Student	
3	grad	Graduation in	1 COMMERCE 2 COMPUTER 3 ENGINEERING 4 MANAGEMENT
4	gender		1 FEMALE 2 MALE
5	FinAccnt	Grade in Financial Accounting	0 to 10, or absent
6	Immersion	Grade in Immersion	0 to 10, or absent
7	ERP	Grade in ERP	0 to 10, or absent
8	Economics	Grade in Economics	0 to 10, or absent
9	Marketing	Grade in Marketing	0 to 10, or absent
10	OrgBehaviour	Grade in Organizational Behaviour	0 to 10, or absent
11	Statistics	Grade in Business Statistics	0 to 10, or absent
12	Total	Term Grade Point Average (TGPA)	0 to 10

Q B1   Using the summary statistics provided below,
(i) Develop a two-way, main effects ANOVA to explore the variation in TGPA (field 12) on account of grad (field 3) and gender (field 4).
(ii) Comment on the analysis

Factor	Level	Mean	Standard Deviation	N
grad	COMMERCE	7.05	0.928	49
	COMPUTER	6.22	0.606	9
	ENGINEERING	6.78	0.686	146
	MANAGEMENT	6.58	0.767	15
gender	FEMALE	7.00	0.843	82
	MALE	6.68	0.689	137
Total		6.80	0.765	219

Q B2   Using the subject grades (fields 5 to 11), a factor analysis was conducted with 3 factors extracted using the "principal axis factor" method and "varimax" rotation. The "factor scores" were saved and used to develop a regression equation where Total (score – field 12) was regressed on the three factor scores.

Based on some of the SPSS regression outputs shown here, answer the questions below on the regression model.

(a) What is the regression equation? What does the coefficient of determination indicate? How good is the generated regression model?
(b) Which is the most important predictor, which is the least?
(c) Explain the ANOVA sum-of-squares decomposition. What is the "model null hypothesis" and the implications of its acceptance / rejection?
(d) Would you expect multicollinearity among the independents? Why or why not? What does the "Tolerance" score in the collinearity statistics indicate? Does it corroborate your expectation?
(e) Interpret the 95% confidence interval for the standardized (beta) coefficients.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.992[a]	.984	.984	.09619

a. Predictors: (Constant), REGR factor score 3 for analysis 2, REGR factor score 2 for analysis 2, REGR factor score 1 for analysis 2

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	125.547	3	41.849	4523.086	.000[a]
	Residual	1.989	215	.009		
	Total	127.536	218			

a. Predictors: (Constant), REGR factor score 3 for analysis 2, REGR factor score 2 for analysis 2, REGR factor score 1 for analysis 2

b. Dependent Variable: Total

Q B3   Using the subject grades (fields 5 to 11), a factor analysis was conducted using   SPSS.

a) What is the research objective behind this "Factor Analysis"? What would the extracted "factors" denote – and how does this provide a means of dimensionality reduction"?
b) Is the sample adequate for conducting Factor Analysis?
c) Based on the "communalities" or otherwise comment on the "contribution" of the measured variables, viz. subject grades (fields 5 to 11), to the factor model.
d) From the "Total Variance Explained" exhibit, draw a scree plot.
e) What is the purpose of "varimax" rotation, used in this procedure?

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
1	3.096	44.226	44.226	2.604	37.202	37.202	1.302
2	.923	13.191	57.417	.493	7.040	44.242	1.132
3	.821	11.734	69.151	.361	5.159	49.401	1.025
4	.667	9.529	78.680				
5	.584	8.343	87.023				
6	.463	6.609	93.632				
7	.446	6.368	100.000				

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Rotation Sums of Squared Loadings	
	% of Variance	Cumulative %
1	18.594	18.594
2	16.170	34.763
3	14.637	49.401
4		
5		
6		
7		

Extraction Method: Principal Axis Factoring.

Communalities

	Initial	Extraction
FinAccnt	.307	.376
Immersion	.307	.666
ERP	.225	.271
Economics	.295	.374
Marketing	.368	.559
OrgBehaviour	.373	.525
Statistics	.319	.687

Extraction Method: Principal Axis Factoring.

Rotated Factor Matrix[a]

	Factor		
	1	2	3
Marketing	.684	.253	.165
OrgBehaviour	.649	.204	.248
ERP	.398	.148	.302
Immersion	.192	.784	.122
FinAccnt	.322	.481	.203
Statistics	.276	.128	.771
Economics	.190	.378	.441

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.818
Bartlett's Test of Sphericity	Approx. Chi-Square	358.341
	df	21
	Sig.	.000

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

C1. A large production firm is extending its production capacity by procuring new machines. The management is considering three designs of workstations (having identical functionalities but offering different ergonomic designs, C,M,F): Classic, Modern and Futuristic.

Since this additional capacity will mostly be manned by contractual workers, management has a choice to bring on board young (between 20 – 35 years), with few years of experience (between 35 – 55 years) and very experienced (above 55 years) workers.

Sometimes back one of their consultants has shown that humidity in workplace does affect productivity of workers. That consultant had used three level of humidity: Upto 30%, Between 40 & 60%, Above 80%.

Management wishes to exercise their choice about machine design, worker age and the humidity level so as to maximize productivity.

	Age 20 - 35	35 - 55	> 55
Classic	123	143	153
Classic	130	145	155
Classic	152	144	134
Modern	134	180	165
Modern	153	148	158
Modern	142	163	178
Futuristic	122	143	175
Futuristic	156	167	134
Futuristic	135	152	198

In order to find out if workers of different age groups can produce similar level of output while working on three designs, they collected replicated output data for one shift of operation as shown below:

The ANOVA table for the above experiment is given below:

ANOVA

Source of Variation	SS	df	MS	F	F crit
Design (CMF)	1196.07	_____	_____	_____	3.55
Age	_____	_____	_____	_____	3.55
Design * Age (Interaction)	343.93	_____	_____	_____	2.93
Within	4614.00	_____	_____		
Total	8542.07	_____			

Formulate hypotheses and infer conclusions.   (Marks 5)

In order to find out if the age of workers, design of workstation and humidity affect the productivity the management decided to collect data as per following sampling plan:

	Age 20 - 35	35 - 55	> 55
Classic	Hum1	Hum2	Hum3
Classic	Hum1	Hum2	Hum3
Classic	Hum1	Hum2	Hum3
Modern	Hum3	Hum1	Hum2
Modern	Hum3	Hum1	Hum2
Modern	Hum3	Hum1	Hum2
Futuristic	Hum2	Hum3	Hum1
Futuristic	Hum2	Hum3	Hurn1
Futuristic	Hum2	Hum3	Hum1

Where Hum1 denotes humidity level of up to 30%; Hum2 represents humidity level between 40 and 60% and Hum3 above 80%. The actual data and corresponding ANOVA table are displayed below:

	Age 20 - 35	35 - 55	> 55
Classic	184	165	110
Classic	178	155	120
Classic	182	160	114
Modern	120	167	140
Modern	130	156	138
Modern	128	161	154
Futuristic	189	160	134
Futuristic	187	157	135
Futuristic	188	172	129

ANOVA

Source of Variation	SS	df	MS	F	F crit
Design (CMF)	1370.889	____	____	____	3.55
Age	6528.667	____	____	____	3.55
Humidity	_____	____	____	____	2.92
Within	536.6667	____	____		
Total	15342	____			

Formulate hypotheses for this stage and draw conclusions.   (Marks 5)
Which combination of worker age, workstation design and humidity level will optimize productivity?   (Marks 5)