



## DEPARTMENT INDUSTRIAL PSYCHOLOGY AND PEOPLE MANAGEMENT

### PROGRAMME IN INDUSTRIAL PSYCHOLOGY NOVEMBER EXAMINATION 2015

**MODULE:** HONOURS IN INDUSTRIAL PSYCHOLOGY:  
PSYCHOMETRIC THEORY

**CODE:** IPS8X07

**DATE:** 9 November 2015

**DURATION:** 3 HOURS

**TIME:**

**MARKS:** 148

**PAGES:** 7 (Including cover page)

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**EXAMINER(S):** Mr Paul Vorster

**EXTERNAL MODERATOR:** Dr Brandon Morgan

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#### INSTRUCTIONS TO CANDIDATES:

- Please make sure your full name and student number is written on the answer sheet provided.
- You can make notes on the question paper.
- All question papers **must** be handed in.
- There are two sections that cover theory and application. These sections are labelled Section A and Section B.
- Section A has 14 questions and is composed of a 98 marks.
- Section B has 5 questions and is composed of 50 marks.
- Please refer to the mark allocation next to the questions for guidance.
- Read the questions carefully and answer on the answer paper. Please write as neatly and legibly as possible.
- This exam paper has 6 pages including the front page.
- You have 3 hours to complete the exam. Plan your time carefully.
- The general University of Johannesburg policies, procedures and rules pertaining to written assessments apply to this examination.

### **Section A: Theory (98 MARKS)**

1. What is a test or measure? (5)
2. What is a measurement scale? (3)
3. Give an example of a five-point Likert-type scale. Assign numbers to the different categories to demonstrate how we make the responses numerical. (5)
4. List and explain the basic questions you need to ask when constructing new items. (9)
5. Define factor analysis with special reference to exploratory factor analysis? (5)
6. a. Why do we do a factor analysis? (5)  
b. Describe the applications of factor analysis (5)
7. a. What are factors? (2)  
b. Also describe the two conceptual models that are found when conducting factor analysis. (4)
8. List and define 7 statistical assumptions that underlie factor analysis. (21)
9. Describe and explain the main approaches to factor analysis? (4)
10. List and define the components that make-up the total variance. (10)
11. a. Describe and define communality in factor analysis. (2)  
b. Also, indicate the guidelines we use when interpreting communalities in factor analysis. (6)
12. What is dimensionality in psychometric testing? (2)
13. What is unidimensionality in psychometric testing? (2)
14. What must a test demonstrate to have construct validity? (8)

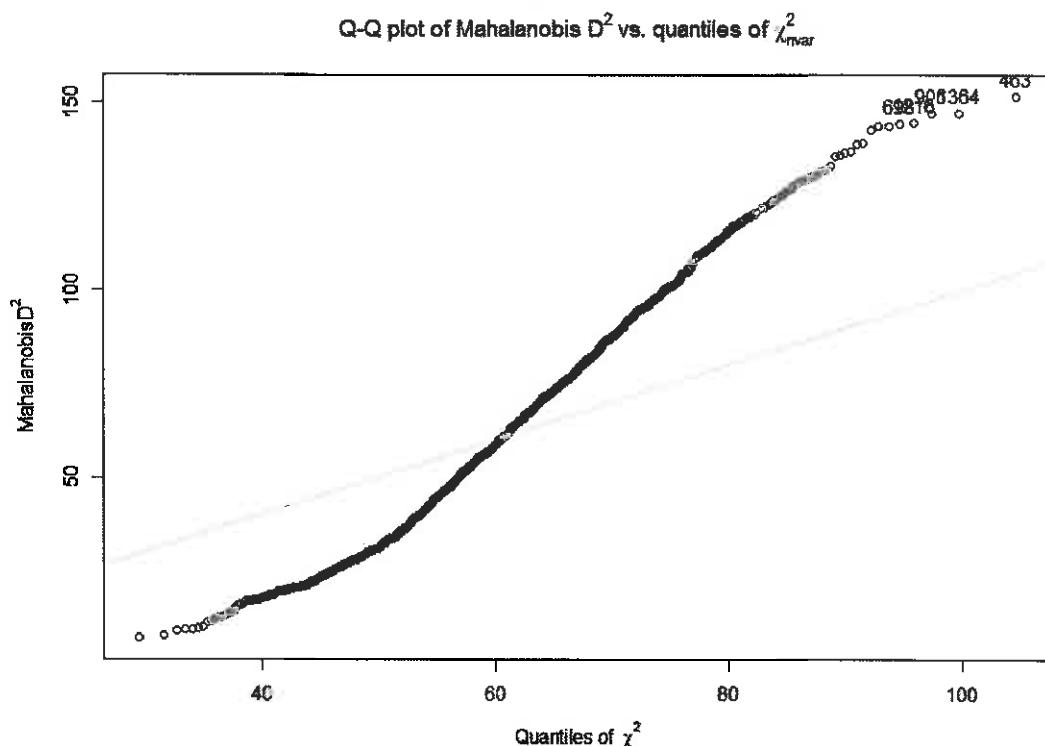
## Section B: Application (50 MARKS)

1. Please refer to the descriptive table below.

tems	vars	1	mean	sd	median	trimmed	mad	min	max	range	skew	Kurtosis	se
1	1	1561	3.13	1.05	4	3.28	0.00	1	4	3	-0.75	-0.85	0.03
2	2	1561	3.13	0.98	3	3.23	1.48	1	4	3	-0.64	-0.93	0.02
3	3	1561	3.27	0.97	4	3.42	0.00	1	4	3	-0.96	-0.43	0.02
4	4	1561	2.68	1.13	3	2.73	1.48	1	4	3	-0.15	-1.40	0.03
5	5	1561	2.02	1.02	2	1.90	1.48	1	4	3	0.77	-0.53	0.03
6	6	1561	1.95	1.01	2	1.81	1.48	1	4	3	0.88	-0.32	0.03
7	7	1561	2.85	1.12	3	2.94	1.48	1	4	3	-0.36	-1.31	0.03
8	8	1561	3.22	0.99	4	3.36	0.00	1	4	3	-0.90	-0.52	0.03
9	9	1561	2.94	1.08	3	3.05	1.48	1	4	3	-0.47	-1.17	0.03
10	10	1561	3.32	0.94	4	3.47	0.00	1	4	3	-1.09	-0.06	0.02
11	11	1561	3.57	0.77	4	3.74	0.00	1	4	3	-1.69	1.82	0.02
12	12	1561	3.51	0.88	4	3.70	0.00	1	4	3	-1.63	1.38	0.02
13	13	1561	3.13	0.97	3	3.24	1.48	1	4	3	-0.64	-0.91	0.02
14	14	1561	3.43	0.88	4	3.58	0.00	1	4	3	-1.27	0.32	0.02
15	15	1561	3.26	0.91	4	3.37	0.00	1	4	3	-0.81	-0.66	0.02
16	16	1561	3.28	0.96	4	3.42	0.00	1	4	3	-0.99	-0.34	0.02
17	17	1561	3.38	0.87	4	3.52	0.00	1	4	3	-1.13	0.06	0.02
18	18	1561	3.24	0.95	4	3.37	0.00	1	4	3	-0.86	-0.60	0.02
19	19	1561	3.55	0.77	4	3.71	0.00	1	4	3	-1.55	1.31	0.02
20	20	1561	2.86	1.10	3	2.96	1.48	1	4	3	-0.38	-1.27	0.03

- 1.1. How many items are in this questionnaire? (1)
- 1.2. What is the mean score on item 10? (1)
- 1.3. What is the most negatively skewed item? (1)
- 1.4. What is the most positively skewed item? (1)
- 1.5. What is the item score range for all the items? (1)
- 1.6. What is the median score for item 20? (1) What is the median? (3)
- 1.7. What is the standard deviation? (2) What item has the highest standard deviation? (1)

2. Please refer to the Mahalanobis distance outlier plot below.

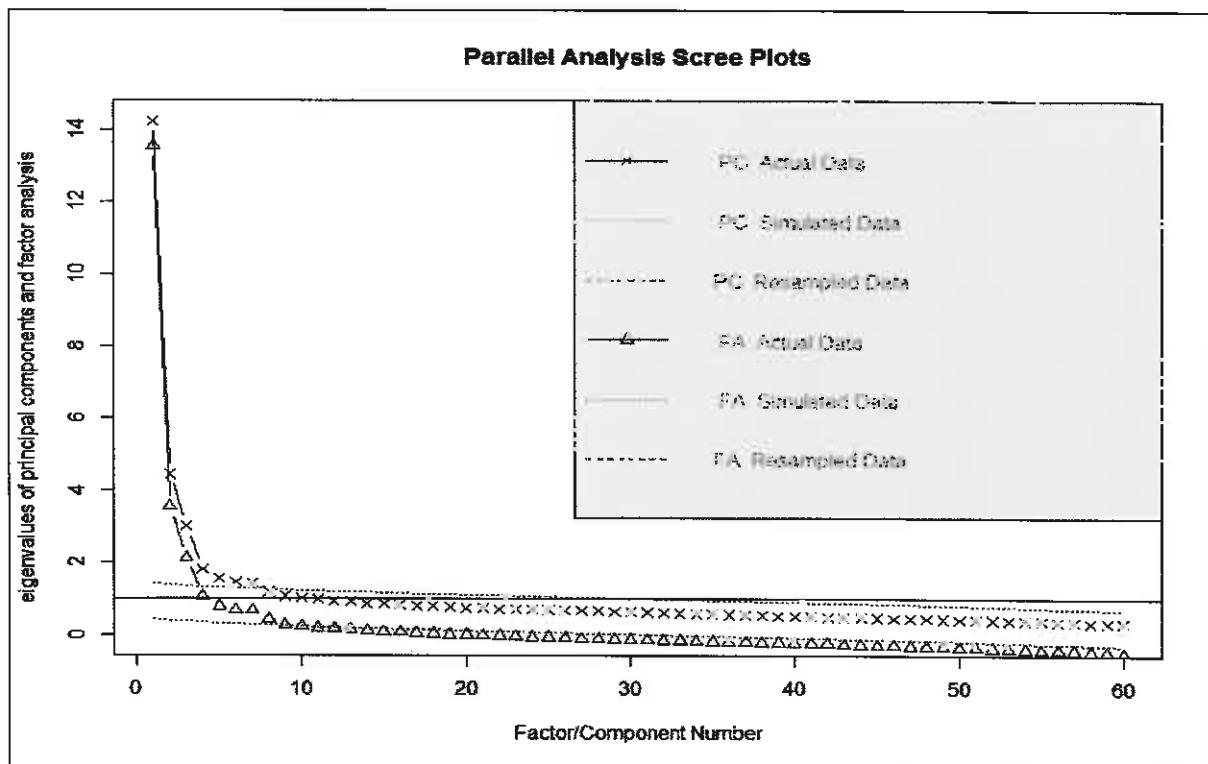


- 2.1. What is an outlier? (2) Why is it important to remove outliers from our data? (2)  
 2.2. Does the Mahalanobis plot indicate multivariate normality? Explain your response. (4)
3. Please refer to the correlation table below for five items used in a scale.

items	i1	i2	i3	i4	i5
1	1	-	-	-	-
2	0.41	1	-	-	-
3	0.47	0.53	1	-	-
4	0.32	0.42	0.36	1	-
5	0.21	0.76	-0.89	-0.41	1

- 3.1. Based on the correlations alone, is this data-set factorable? (2)  
 3.2. Which two item(s) are the most strongly related to one another? (2). What does this relationship mean? (2)

4. Please refer to the scree-plot below.



- 4.1. How many factors and components would you retain? (2) Explain your answer (3)  
 5. Refer to the factor loading matrix of an exploratory factor analysis on the next two pages.

Items	MR2	MR1	MR3	h <sup>2</sup>	u <sup>2</sup>	com
1	0.50	-0.07	-0.01	0.25	0.75	1.00
2	0.43	-0.04	0.15	0.19	0.81	1.30
3	0.33	-0.06	0.12	0.12	0.88	1.30
4	0.34	-0.16	0.05	0.13	0.87	1.50
5	0.62	0.07	0.07	0.39	0.61	1.00
6	0.34	-0.11	0.26	0.16	0.84	2.10
7	0.62	-0.03	0.07	0.39	0.61	1.00
8	0.74	-0.01	-0.03	0.55	0.45	1.00
9	0.71	0.11	-0.08	0.53	0.47	1.10
10	0.47	0.11	-0.16	0.25	0.75	1.30
11	0.50	-0.05	0.03	0.25	0.75	1.00
12	0.55	0.20	-0.11	0.34	0.66	1.30
13	0.29	0.13	-0.19	0.12	0.88	2.20
14	0.50	-0.13	-0.04	0.27	0.73	1.10

15	0.78	0.03	0.01	0.61	0.39	1.00
16	0.76	0.03	0.02	0.58	0.42	1.00
17	-0.06	0.17	-0.05	0.03	0.97	1.40
18	0.23	0.17	0.19	0.15	0.85	2.80
19	0.03	0.56	-0.21	0.25	0.75	1.30
20	0.02	0.73	-0.21	0.43	0.57	1.20
21	-0.04	0.72	-0.04	0.50	0.50	1.00
22	0.38	-0.11	0.03	0.15	0.85	1.20
23	0.04	0.58	0.11	0.42	0.58	1.10
24	0.02	0.69	0.05	0.51	0.49	1.00
25	-0.18	0.26	0.34	0.30	0.70	2.40
26	0.04	0.31	0.10	0.14	0.86	1.20
27	0.42	0.52	-0.04	0.44	0.56	1.90
28	0.34	0.35	0.01	0.25	0.75	2.00
29	0.13	0.47	-0.10	0.21	0.79	1.30
30	0.22	0.12	0.25	0.15	0.85	2.50
31	0.13	0.60	0.16	0.49	0.51	1.20
32	-0.17	0.58	0.00	0.37	0.63	1.20
33	-0.05	0.70	-0.12	0.42	0.58	1.10
34	0.07	0.50	0.21	0.40	0.60	1.40
35	0.31	0.46	-0.03	0.31	0.69	1.80
36	-0.08	0.45	0.00	0.21	0.79	1.10
37	0.07	-0.20	0.40	0.13	0.87	1.50
38	-0.23	0.07	0.12	0.08	0.92	1.70
39	0.22	0.12	0.30	0.18	0.82	2.10
40	0.09	-0.17	0.65	0.35	0.65	1.20
41	0.04	-0.09	0.62	0.34	0.66	1.10
42	-0.21	0.14	0.26	0.17	0.83	2.50
43	-0.22	0.27	0.04	0.13	0.87	2.00
44	-0.33	0.04	0.19	0.16	0.84	1.70
45	-0.15	0.23	0.19	0.15	0.85	2.70
46	-0.08	0.25	0.32	0.25	0.75	2.00
47	-0.03	0.18	0.37	0.23	0.77	1.50
48	0.32	-0.03	0.40	0.24	0.76	1.90
49	-0.35	0.08	0.38	0.31	0.69	2.10
50	0.06	-0.04	0.56	0.30	0.70	1.00
51	-0.17	0.03	0.59	0.40	0.60	1.20
52	-0.18	-0.06	0.67	0.46	0.54	1.20
53	-0.24	0.01	0.49	0.31	0.69	1.50
54	0.21	0.01	0.54	0.33	0.67	1.30
55	0.11	0.04	0.56	0.35	0.65	1.10
56	-0.28	0.20	0.15	0.17	0.83	2.40

5.1. Which items make up factor 1 (MR1). Explain why you chose these items. (8)

- 5.2. Which items would you flag for removal? (9) Indicate why you have flagged the item(s) for removal? (2)**