UNIVERSITY OF JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA *ENGINEERING: INDUSTRIAL*
SUBJECT	:	**FACILITY LAY-OUT DESIGN AND MATERIAL HANDLING**
CODE	:	**BFM 2111**
DATE	:	JULY SSA EXAMINATION : 26 JULY 2016
DURATION	:	(SESSION 1) 08:00 - 11:00
TOTAL MARKS	:	100

ASSESSOR	:	MR R P MUTYAVAVIRE
MODERATOR	:	MR S CHIKUMBA
NUMBER OF PAGES	:	PAGES 4

INSTRUCTIONS	:	ONLY ONE POCKET CALCULATOR PER CANDIDATE MAY BE USED.
REQUIREMENTS	:	

INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

QUESTION 1

1.1 Material handling is classifiable into four (4) generic categories. List and explain each category giving equipment examples.

(8)

1.2 A cell phone factory has confirmed orders of 80 000 units. The factory operates a double shifts, 5 days per week, 4 weeks per month. The employees are afforded 60 minutes personal time per day. The plant efficiency is 80%. The handset assembly process constitutes 4 main processes whose defectives rates are 7%, 2%, 2.5% and 1% respectively. Calculate the plant R-value.

(8)

1.3 Discuss why safety considerations are critically important in the design of materials handling equipment.

(4)

[20]

QUESTION 2

2.1 A small foundry consists of five (5) main divisions. Minimum space requirements for each department are illustrated in table 2 below. The departmental activity relationships are illustrated in REL chart below.

Table 2

Department	**Area (sq m)**
1.moulding	12 000
2.pattern shop	1 000
3.fettling	2 000
4.sand mixing	3 000
5.storage	6 000

1	2	3	4	5	
	E4	A1	A2	I	1
		O	E	I	2
			I		3
				A1	4
					5

2.1 Construct a worksheet and the respective dimensionless block diagram based on the REL Chart above.

(10)

2.2 Fit the departments into a building measuring 200m x 150m. Allow for 20m wide aisles in-between the departments. Use an appropriate scale.

(10)

[20]

QUESTION 3

3.1 Precision Enterprises produces six (6) different products. The routing for each product is given in table Q3. The machines are identified 1 – 7. They are arranged in increasing numerical order. Using the multi-column chart or otherwise, determine the efficiency of this machine arrangement.

(15)

Table Q3

Part	Routing
A	1 2 3 4 7
B	1 3 2 6 7
C	1 4 5 3 6 7
D	1 4 3 5 6 7
E	1 2 6 5 7
F	1 3 2 5 7

3.2 Define back-tracking. Show that back-tracking increases material handling costs three fold.

(5)

[20]

QUESTION 4

4.1 List and briefly discuss any six (6) auxiliary service facilities an Industrial Engineer should plan for at any production plant.

(12)

4.2 Discuss two (2) advantages and two (2) disadvantages of a common receiving and shipping department.

(4)

4.3 An Industrial Engineer is required to specify the most appropriate material handling system for the following cases:
(i) Moving mining aggregates over a distance of 500km from a mine crusher to port.
(ii) Packaged toxic chemicals to various points in the plant.

(4)

[20]

QUESTION 5

5.1 A two (2) stage stamping process produces cutlery. There are 3 workstations in total. Workstation 2 reworks defectives from workstation 1. The workstation defectives rates are 2%, 5% and 4% respectively. An order of 100 000 plates has been placed. How many blanks should be ordered? All working should be clearly shown.

(10)

5.2 A steel furniture producer makes seven (7) different chair sizes. The production schedule based on demand is illustrated in table Q5 below. The production process involves spray painting and baking on a conveyor belt. Assuming 10% non-productive time per shift, 90% plant efficiency and a hook spacing of 50cm. Determine the conveyor speed necessary to meet production requirements.

(10)

Table Q5.

Chair No.	Chairs per Hook	Quantity per shift
001	2	5000
002	5	1500
003	1	200
004	7	4200
005	4	1600
006	3	900
007	2	500

[20]

TOTAL = 100