



**PROGRAM** : NATIONAL DIPLOMA  
ENGINEERING: INDUSTRIAL

**SUBJECT** : FACILITY LAY-OUT DESIGN AND  
MATERIAL HANDLING

**CODE** : BFM 2111

**DATE** : WINTER SSA EXAMINATION 2015  
22 JULY 2015

**DURATION** : (SESSION 2) 11:30 - 14:30

**WEIGHT** : 50 : 50

**TOTAL MARKS** : 100

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**ASSESSOR** : MR R P MUTYAVAVIRE

**MODERATOR** : MR S CHIKUMBA

**NUMBER OF PAGES** : PAGES 4

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

**REQUIREMENTS** :

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**INSTRUCTIONS TO STUDENTS**

PLEASE ANSWER ALL QUESTIONS.

**QUESTION 1**

- 1.1 Discuss in good detail the impact of facilities planning on the competitiveness of manufacturing facilities. (5)
- 1.2 A garment factory has an annual demand of 30 000 pieces of clothing. The factory operates a single shift, 5 days per week, 4 weeks per month. The employees are afforded 1hr personal time per day. The plant efficiency is 90%. The garment making process constitutes 4 main processes whose defectives rates are 4%, 2%, 0.5% and 1% respectively. Calculate the plant R-value. (8)
- 1.3 Briefly discuss why safety considerations are critically important in the design of materials handling systems. (4)
- [20]

**QUESTION 2**

- 2.1 Part back-tracking is frequently encountered in production processes. Explain back-tracking? Why is it necessary to minimise its occurrence in a factory? (4)
- 2.2 The routing of four parts in a job shop production facility is illustrated in fig. Q2 below. Draw a string diagram and a multi-column flow process chart for the four parts. (10)

Table Q2

Part No.	Routing
001	1 2 4 3 7
002	1 3 2 6 7
003	1 3 4 5 6 7
004	1 4 5 3 7

- 2.3 Use the multi-column process chart to calculate the efficiency of this machine machine/product arrangement. Assume there are seven machines arranged in order of their numerical values. (6)

**[20]**

**QUESTION 3**

- 3.1 Apart from planning for the core production factory, an industrial Engineer has to provide for several auxiliary service facilities. Discuss briefly any five (5) such facilities you would plan for in a plant. (10)
- 3.2 Industrial Engineers are now combining receiving and shipping departments in factory lay out planning. Give three (3) advantages and three (3) disadvantages for a common receiving/shipping department. (6)
- 3.3 A household utensil manufacturing process involves moving light but high volumes of components from punching through painting to assembly. Solve this material handling problem systematically with the aid of the material handling equation. (4)

**[20]****QUESTION 4**

- 4.1 An electronic accessories assembly line is required to produce 1500 units per 8 hour shift at 85% efficiency and personal time is 30 minutes. Balance the assembly line given additional data in table Q4 below.

Table Q4

(15)

OPERATION NUMBER	TIME STANDARD
005	0.390
010	0.235
015	0.700
020	1.000
025	0.240
030	0.490

- 4.1.2 Calculate the efficiency of the assembly line evaluated in question 4.1

(5)

**[20]****QUESTION 5**

- 5.1 The production schedule of a vehicle body panel production company is illustrated in table Q5 below. The production process involves pressing, spray painting, baking and cooling on a conveyor belt. Assuming 10% non-productive time per shift, 95% efficiency and a hook spacing of 30cm. calculate the conveyor speed necessary to meet production requirements.

(15)

Table Q5.

Part No.	Parts per Hook	Quantity per shift
005	2	3000
010	5	1800
015	1	900
020	7	10500
025	4	600
030	3	450
035	2	750

- 5.2.1 The panels need 15 minutes cooling time before they can be safely handled by operators on the assembly line. How long should the conveyor be from the oven to the start of the assembly?

(3)

- 5.2.2 An increase in vehicle demand is anticipated for a limited period. How can the process Engineer accommodate this increase without purchasing additional machinery?

(2)

[20]

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**TOTAL = 100**

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