



**PROGRAM** : NATIONAL DIPLOMA  
ENGINEERING : INDUSTRIAL

**SUBJECT** : **PRODUCTION ENGINEERING 1**

**CODE** : **BEP 121**

**DATE** : SUMMER SSA EXAMINATION  
10 JANUARY 2017

**DURATION** : (SESSION 2) 11.30 - 14:30

**WEIGHT** : 40 : 60

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**TOTAL MARKS** : 100

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**ASSESSOR** : MR F CHIROMO

**MODERATOR** : MRS P DUBE

**NUMBER OF PAGES** : 5 PAGES

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**INSTRUCTIONS TO STUDENTS:**

- ANSWER ALL QUESTIONS.
- A STUDENT IS EXPECTED TO MAKE REASONABLE ASSUMPTIONS FOR DATA NOT SUPPLIED.
- NUMBER YOUR QUESTIONS CLEARLY.
- ANSWERS WITHOUT UNITS WILL BE IGNORED.

### **QUESTION 1**

- 1.1 Explain what is meant by reverse engineering. (4)
- 1.2 Discuss three forms of screening processes involved in filtering of Concepts. (6)
- 1.3 There are basically four perspectives associated with formulation of Operations strategy; top-down, operations resources, market requirements and bottom-up perspectives. Discuss in detail the market requirements strategy formulation perspective. (10)
- [20]**

### **QUESTION 2**

Table Q2 details the tasks required for a manufacturer of industrial vacuum cleaners. The times in the table are in minutes. Demand forecasts indicate a need to operate with a cycle time of 10 minutes.

Table Q2

Activity	Activity Description	Immediate predecessors	Time
A	Attach wheels to tub	-	5
B	Attach motor to lid	-	1.5
C	Attach battery pack	B	3
D	Attach safety cutoff	C	4
E	Attach filters	B	3
F	Attach lid to tub	A, E	2
G	Assemble attachments	-	3
H	Function test	D, F, G	3.5
I	Final inspection	H	2
J	Packing	I	2

- 2.1 Draw the appropriate precedence diagram for this production line. (4)
- 2.2 Determine the theoretical/minimum number of workstations. (4)
- 2.3 Assign tasks to workstations and determine how much idle time is present in each cycle. (6)
- 2.4 Discuss how this balance could be improved to 100%. (2)
- [16]**

### **QUESTION 3**

- 3.1 With the issues of environmental protection becoming more important, designers increasingly have to take 'green' issues into account.

Discuss five issues that must be considered with regard to the environmental sensitiveness of design. (10)

**(Question 3 – continued)**

- 3.2 Discuss five common types of processes in manufacturing. (10)  
[20]

**QUESTION 4**

Mfundo's Video, a major video rental and TV sales chain headquartered in Johannesburg, is about to open its first outlet in Durban, and wants to select a site that will place the new outlet in the centre of Durban's population base. Mfundo examines results from seven constituencies in Durban, plots the coordinates of the centre of each constituency on a map. He uses the population size in each constituency as a weighting. The information gathered is as in Table Q4.

Table Q4

Constituency	Population in Constituency	x, y Map Coordinates
A	2 000	(25, 45)
B	5 000	(25, 25)
C	10 000	(55, 45)
D	7 000	(50, 20)
E	10 000	(80, 50)
F	20 000	(70, 20)
G	14 000	(90, 25)

- 4.1 At what centre-of-gravity coordinates should the new store be located? (8)  
4.2 Constituencies "C" and "E" are each projected to grow by 20% in the next year. How will this influence the new coordinates for the store? (8)  
[16]

**QUESTION 5**

- 5.1 Six jobs are to be processed through a two-step operation. The first operation involves sanding, and the second involves painting. Processing times are as shown in Table Q5.

Table Q5

Job	Operation 1 (hours)	Operation 2 (hours)
A	10	5
B	7	4
C	5	7
D	3	8
E	2	6
F	4	3

**(Question 5 – continued)**

Determine a sequence that will minimise the total completion time for these jobs. Illustrate graphically. (6)

- 5.2 Briefly discuss the following types of customer-processing technologies:
- 5.2.1 technologies that have active interaction with the customer; (5)
- 5.2.2 technologies that have passive interaction with the customer. (5)
- [16]**

**QUESTION 6**

South West Gauteng College promotes a wide range of executive-training courses for firms in the West Rand and Randfontein region of Johannesburg. The Principal believes that individually typed letters add a personal touch to marketing. To prepare letters for mailing, he conducts a time study on his secretaries. On the basis of the observations shown in Table Q6, he wishes to develop a standard time for the whole job. The college uses a total allowance factor of 12%. The Principal decides to delete all unusual observations from the time study.

Table Q6

Element	Observations (minutes)						Performance rating (%)
	1	2	3	4	5	6	
Typing letter	2.5	3.5	2.8	2.1	2.6	3.3	85
Typing envelope	0.8	0.8	0.6	0.8	3.1 <sup>a</sup>	0.7	100
Stuffing envelope	0.4	0.5	1.9 <sup>a</sup>	0.3	0.6	0.5	95
Sealing, sorting	1.0	2.9 <sup>b</sup>	0.9	1.0	4.4 <sup>b</sup>	0.9	125

<sup>a</sup>Disregard – secretary stopped to answer the phone

<sup>b</sup>Disregard – interruption by supervisor

Determine the standard time. (12)

**[12]**

**TOTAL = 100**