



PROGRAM : NATIONAL DIPLOMA
ENGINEERING : INDUSTRIAL

SUBJECT : **PRODUCTION ENGINEERING II**

CODE : **BEP 231**

DATE : WINTER EXAMINATION 2015
12 JUNE 2015

DURATION : (SESSION 1) 08:30 - 11:30

WEIGHT : 50 : 50

TOTAL MARKS : 100

ASSESSOR : MR P. DUBE

MODERATOR : MR S. TARUVINGA

NUMBER OF PAGES : 4 PAGES

INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

REQUIREMENTS

ONLY ONE POCKET CALCULATOR PER CANDIDATE MAY BE USED.
GRAPH PAPER

Question 1.

The following table, Table Q1 represents a plan for a project

Table Q1

Activity	Immediate Predecessor(s)	Normal Time	Crash Time	Normal Cost	Crash Cost
A	-	7	6	R7,000	R8,000
B	A	3	2	5,000	7,000
C	A	4	3	9,000	10,200
D	B	5	4	3,000	4,500
E	C	2	1	2,000	3,000
F	C	4	2	4,000	7,000
G	F,E,D	5	5	5,000	8,000

- 1.1 Construct the appropriate network diagram. (3)
 - 1.2 What is the completion time for the project? (2)
 - 1.3 What is the critical path? (2)
 - 1.4 Calculate the total Slack time (3)
 - 1.5 If the project is to be shortened by four days, show which activities, in order of reduction, would be shortened and the resulting cost (10)
- [20]**

Question 2.

One unit of **A** is composed of 2 units of **B** and three units of **C**. Each **B** is composed of one unit of **F**. **C** is made up of one **F**. **C** is made up of one unit of **D**, one unit of **E**, and two units of **F**. Items **A**, **B**, **C**, and **D** have 20, 50, 30, and 25 units of on hand inventory. Items **A**, **B**, and **C**, use lot-for-lot as their lot sizing technique, while **D**, **E**, and **F** require multiples of 50, 100, and 100, respectively, to be purchased. **B** has scheduled receipts of 30 units in period 1. No other scheduled receipts exist. Lead times are one period for items **A**, **B**, and **D** and two periods for items **C**, **E**, and **F**. Gross requirement for **A** are 20 units in period 1, 20 units in period 2, 60 units in period 6, and 50 units in period 8.

- 2.1 Draw the bill of materials (products structure) (5)
 - 2.2 Find the planned order release for all items. (20)
- [25]**

Question 3

A particular raw material is available to a company at three different prices, depending on the size of the order:

Less than 100 Kgs	R200 per Kg
100 Kg to 999 Kg	R190 per Kg
More than 1000 Kg	R180 per Kg

The cost to place an order is R400. The annual demand is 3000 units. Holding (or carrying cost) is 25% of material price. What is the economic order quantity to buy each time? [13]

Question 4

4.1 Mandla Shoe Company manufactures a number of different styles of athletic shoes. Its biggest seller is the D-Pacer running shoe. In 2011 Mandla implemented a quality-management program. The company's shoe production for the past 3 years and manufacturing costs are as follows (Table Q4)

Table Q4.1

	Year		
	2011	2012	2013
Units produced/Input	32,000	34,600	35,500
Manufacturing cost	R278,000	R291,000	305,000
Percent good quality	78%	83%	90%

Only one quarter of the defective shoes can be reworked, at a cost of R2.00 apiece. Compute the manufacturing cost per product for each of the 3 years and indicate the annual percentage increase or decrease resulting from quality- management program (8)

4.2 The reliability of the given system is to be improved to 0.75. An element is added as shown in Figure Q4.2 to accomplish this. What is the reliability of the added component? (4)

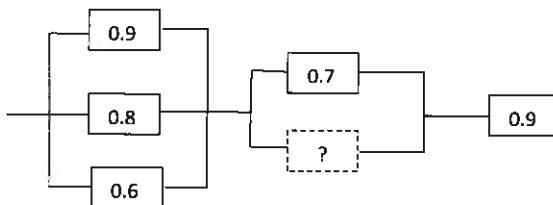


Figure Q4.2

4.3 Consider a machine with the following recorded times between failure and repair times in days.

Table Q4.3

i	1	2	3	4	5	6	7
Time between failure, T_i	30	21	23	28	27	24	29
Repair times, D_i	3	6	6	5	3	7	4

4.3.1 Calculate MTBF and MTTR (6)

4.3.2 Calculate the system availability (6)

4.3.3 For an exponential distribution, find the probability that the product does not fail in the first 30 days (3)

4.3.4 For a normal distribution, find the probability that the product does not fail in the first 28 days (4)

[31]

Question 5

Jobs processed through Mike's machine shop pass through four operations, parting off (power saw), milling, grinding and turning. The processing times and due dates required for each job are given in Table Q5

Table Q5

Job	Power Saw	Grinding	Milling	Turning	Due date
A	1 hour(s)	5 hour(s)	1 hour(s)	4 hour(s)	14
B	1 hour(s)	3 hour(s)	2 hour(s)	5 hour(s)	21
C	1 hour(s)	2 hour(s)	3 hour(s)	2 hour(s)	10
D	2 hour(s)	4 hour(s)	5 hour(s)	1 hour(s)	12
E	1 hour(s)	3 hour(s)	1 hour(s)	2 hour(s)	15

5.1 Using sequence A,C,B,E,D, construct a Gantt chart, for each machine. (6)

5.2 Calculate the make-span (3)

5.3 Average flow time (3)

[12]

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