UNIVERSITY OF JOHANNESBURG

PROGRAM	: BENG TECH *INDUSTRIAL ENGINEERING TECHNOLOGY*
SUBJECT	: **PRODUCTION ENGINEERING 2A**
CODE	: **PDEMIA 2A**
DATE	: SUPPLEMENTARY EXAMINATION 18 JULY 2019
WEIGHT	: 40:60
DURATION	: (SESSION 2) 11:30-14:30
TOTAL MARKS	: 100

EXAMINER	: Y. MAWANE
MODERATOR	: P. DUBE
NUMBER OF PAGES	: 6 PAGES

INSTRUCTIONS

1. ANSWER ALL QUESTIONS.
2. WRITE LEGIBLE AND NUMBER YOUR ANSWERS ACCORDING TO THE QUESTION PAPER.
3. ONE CALCULATOR PERMITTED PER STUDENT.

QUESTION 1

1.1 Vilakazi machine shop uses 2500 brackets during the course of the year and this usage is relatively constant throughout the year. These brackets are purchased from a supplier 100 kilometers away for R15 each and the lead time is 2 days. The holding cost per bracket per year is R1.50 (Or 10% of the unit cost) and ordering cost per order is R18.75. There are 250 working days per year.

1.1.1 Calculate the economic order quantity. (2)

1.1.2 Determine the average inventory. (2)

1.1.3 Calculate the annual inventory holding cost. (2)

1.1.4 Calculate the annual ordering cost. (2)

1.1.5 In minimizing cost, determine the number of orders that should be place each year. (2)

1.1.6 Calculate the total annual inventory cost. (2)

1.1.7 Determine the reorder point. (2)

1.2 Vilakazi wants to reconsider his decision of buying the brackets and is considering making the brackets in house. He has determined that setup cost would be R25 in machinist time and lost production time. 50 brackets could be produced in a day once the machine has been set up. Vilakazi estimates that the cost (including labour time and materials) of producing one brackets would R14.80. The holding cost would be 10% of this cost.

1.2.1 Determine the daily demand. (2)

1.2.2 Calculate the optimal production quantity. (4)

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QUESTION 2

Assume that you are a manager of a shop that assembles power tools. You have just received an order for 50 chain saw, which are to be shipped at the start of week 8. Pertinent information on the saw is as follows:

Item	Lead times	On hand	Components
Saw	2	15	A(2), B(1), C(4)
A	1	10	E(3), D(1)
B	2	5	D(2), F(3)
C	2	65	E(2), D(2)
D	1	20	
E	1	10	
F	2	30	

2.1 Develop a product structure tree for the saw. (5)

2.2 Develop a material requirements plan. (15)

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QUESTION 3

3.1 All projects need a project manager. Discuss five (5) characteristics that are seen as important in an effective project manager. (10)

3.2 Bench marking is the process of learning from others and involves comparing one's own performance or methods against other comparable operations. Briefly discuss different types of benchmarking that can be used to stimulate creativity in improvement practices. (6)

3.3 Discuss how failure is measured in any operation. (4)

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QUESTION 4

You are creating a market research project for Longrich Company. It has been indicated that you will receive a R45 000 bonus for completing the project within 35 days, which has been captured in the contract. The contract also contains a penalty clause in which you will lose

R500 for each day the project takes longer than 35 working days. The following information has been collected:

Task	Duration	Predecessor
A	5	-
B	8	A
C	3	B
D	4	A
E	5	C
F	7	C
G	6	D,E
H	8	F
I	6	G
J	5	H,I

Given the information in the precedence table above:

4.1 Develop and construct a project network diagram. (6)

4.2 Complete the forward and backward pass. (5)

4.3 Compute the activity slack (float). (5)

4.4 Identify the critical path. (2)

4.5 Do you expect to receive a bonus or penalty on this project? Explain. (2)

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QUESTION 5

5.1 A machine can operate for an average of 12 weeks before it needs to be overhauled, a process which takes two days. The machine is operated five days a week. Calculate the availability of the machine. (3)

5.2 A local bank is searching for ways to improve its service. One teller keeps a control chart for the service processes for customers and has 400 samples. It was found that from the service offered 60 services had one or more defects and there were 80 defects in total. Five types of errors were observed in the service process.

Determine the defects per million opportunities for the process. (7)

5.3 One of the industrial robots designed by a leading producer of servomechanisms has four major components. Components reliabilities are 0.98; 0.95; 0.94 and 0.90. All of the components must function in order for the robot to operate effectively.

5.3.1 Calculate the reliability of the robot. (2)

5.3.2 Designers want to improve the reliability by adding a backup component. Due to space limitations, only one backup can be added. The backup for any component will have the same reliability as the unit for which it is the backup. Determine the component that should get the backup in order to achieve the highest reliability. (8)

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FORMULA SHEET

Utilisation = $\frac{actual\ output}{design\ capacity}$

Efficiency = $\frac{actual\ output}{effective\ capacity}$

OEE = a x p x q

Holding costs = holding cost/unit x average inventory

$= C_h \times \frac{Q}{2}$

Ordering costs = ordering cost x number of orders per period

$= C_o \times \frac{D}{Q}$

Total cost = $\frac{Ch\ Q}{2} + \frac{CoD}{Q}$

EOQ = $\sqrt{\frac{2CoD}{Ch}}$

EBQ = $\sqrt{\frac{2CoD}{Ch(1-(D/P)}}$

ROP = d x L