UNIVERSITY
OF
JOHANNESBURG

PROGRAM	:	BACHELOR OF TECHNOLOGY
		CHEMICAL ENGINEERING
SUBJECT	:	**PRODUCTION ENGINEERING: CHEM INDUSTRY 4**
CODE	:	**PCI411**
DATE	:	SUMMER EXAMINATION
		18 NOVEMBER 2019
DURATION	:	(SESSION 2) 12:30 - 15:30
WEIGHT	:	40 : 60
TOTAL MARKS	:	100

EXAMINER(S)	:	MR P MJWANA
MODERATOR	:	DR. C BHONDAYI
NUMBER OF PAGES	:	3 PAGES

REQUIREMENTS	:	Use of scientific (non-programmable) calculator is permitted
		(only one per candidate)

HINTS AND INSTRUCTIONS TO CANDIDATE(S):

- **ATTEMPT <u>ALL</u> QUESTIONS**. Please answer each question to the best of your ability.
- Write your details (module name and code, ID number, student number etc.) on script(s).
- Number each question clearly; questions may be answered in any order.
- Make sure that you <u>read each question carefully</u> before attempting to answer the question.
- Transfer the answers accurately onto Blackboard (Bb).

QUESTION 1 [Total: 27 Marks]

At any time, 5 persons are available for a large chemical plant to fix a large number of controllers, and 2 of them break down every 5 hours on average. It takes a person 10 hours on average to fix one controller. Determine the total hourly cost of labour and controller downtime in R per hour (assume 24 hour operation). The costs of these are given on Blackboard.

QUESTION 2 [Total: 13 Marks]

You are a technical investment advisor employed at a bank due to your BTech qualification, and control R500mil that needs to be invested. A company has approached you with a renewable energy project in the Northern Cape. Due to the recent drop in energy prices, no profit will be made if the R500mil is invested in this project. However, if the Government and Eskom agree to subsidize the production of electricity (the % chance of this happening is given for you on Bb), then a profit of R150mil will be made by the bank. However, building a small coal-fired power plant for R500mil will bring in a profit of R100mil.

2.1 Draw a decision tree and calculate the expected monetary values. (9)

2.2 Would you invest the money in the renewable energy project or the coal-fired power plant? (4)

QUESTION 3 [Total: 18 Marks]

3.1 You are 45 years old and now have R100 000 to invest. If you put it in a bank, it will earn an interest of R8 000. If you invest it in another fan factory, you can earn an amount given on Bb in Rands if the price of the fans increases. The chance of this happening is 70%. However, if the price drops or stays the same, you stand to lose R1000. Using the techniques taught in this course, decide what to do. (14)

3.2 You can also get a recommendation from an expert market analyst to invest (call this advice X1) or not to invest (advice X2). Available information indicates that in 1000 cases where the price of equipment went up, the analyst's advice was to invest in 900 of the cases. In 1000 cases where the price of equipment dropped or stayed the same, the analyst's advice was not to invest in 600 of the cases. Calculate the overall likelihood of the analyst advising to invest (good or bad market, $P(X1)$). (4)

QUESTION 4 [Total: 20 Marks]

A company operates two factories A and B with capacities 350 and 650 units respectively and two warehouses Y and Z with demands of 300 and 700 units. The transport costs per unit are given on Bb.
4.1 Calculate an initial transport cost using the NWC method (5)
4.1.2 Find the Improvement index (3)
4.2 What is the optimum cost using the stepping stone method (5)
4.3 Answer the question on Bb regarding dummies (2)

4.4. Determine the optimum minimum transportation cost for the transportation scenario given on Bb   (5)

QUESTION 5   **[Total: 22 Marks]**

5.1. If you were setting up the crash time schedule of the project in the table, how many weeks will the duration be?   (8)

5.2. Draw an annotated diagram of a queuing system.   (4)

5.3. How many weeks will the duration be if you were to set the normal time schedule   (6)

5.4. If an **Activity F** were introduced at the last minute and its most optimistic time were dependent on the previous activity times. Determine the most optimistic time for Activity F using MA(3x3)   (4)

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END   **[Total: 100 Marks]**

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