PROGRAM	:	BACCALAUREUS TECHNOLOGIAE *CHEMICAL ENGINEERING*
SUBJECT	:	**PRODUCTION ENGINEERING: CHEMICAL INDUSTRY 4**
CODE	:	**PCI411**
DATE	:	SUMMER EXAMINATION 2015 12 NOVEMBER 2015
DURATION	:	(SESSION 1) 08:30 - 11:30
WEIGHT	:	40 : 60
TOTAL MARKS	:	86
FULL MARKS	:	86

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NUMBER OF PAGES	:	PAGES 3	

INSTRUCTIONS	:	ANSWER ALL QUESTIONS AND ENTER FINAL ANSWERS ON BLACKBOARD (Bb) AS REQUIRED. ANSWER FOLLOW-UP QUESTIONS ON BLACKBOARD AS REQUIRED HAND IN ATTENDANCE SLIP AND EXAM BOOKS WITH ROUGH WORK

QUESTION 1

Cj		50	b	40	0	0	0	0	
	VAR	A	B	C	S1	S2	S3	S4	VAL
50	A	1	2	0	2	0	-1	0	160
0	S2	0	1	0	0	1	-1	0	200
40	C	0	-3	1	-3	0	2	0	10
0	S4	0	10	0	8	0	-5	1	140
	Zj	50	-20	40	-20	0	30	0	8400
	Cj-Zj	0	b+20	0	20	0	-30	0	

Consider the intermediate tableau for an integer linear programming problem above.

1.1.   Set up the next tableau using the coefficient of B (b) given on Bb, and calculate the profit of the resulting production setup.   (14)

1.2.   What are the values of the variables in the tableau you set up?   (2)

1.3.   Does the tableau you set up represent a feasible solution?   (2)

1.4.   Does the tableau you set up represent an optimum solution?   (2)

1.5.   Would it have been possible to solve the problem by graphical means? Explain.   (2)

[22]

QUESTION 2

Consider the following transport allocation problem:
A company supplies two warehouses with crates of goods that are produced in three factories: A, B and C. Capacities, demands and shipping costs in R/crate are given in the table:

Factory	Warehouse		Capacity (crates)
	X	Y	
A	60	35	300
B	50	30	600
C	20	10	200
Demand	700	400	

2.1.   Without solving the problem, which method(s) would you choose to find the optimum allocation?   (2)

2.2.   Analyze your choice in 2.1   (4)

2.3.   Make the allocation requested on Bb.   (6)

[12]

QUESTION 3

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.

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

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

[13]

QUESTION 4

The accompanying table gives cash flows calculated for a business that cost R3mil to finance (finance amount).

Year	Cash Flow Rmil
1	0.49
2	0.51
3	0.51
4	0.56
5	0.57
6	0.6

4.1.   Calculate the PVR of the business using the interest rate given on Bb and yearly compounding.   (5)

4.2.   Was the business profitable? Why?   (2)

4.3.   The cash flow seemed to be a bit low in the third year. Set up a linear regression model and calculate the cash flow you would have expected in year 3 in Rmil.   (11)

[18]

QUESTION 5

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)

Activity	Time Estimate (weeks)			
	Most Optimistic (a)	Most Likely (m)	Most Pessimistic (b)	Imme-diate pre-decessor
A	11	12	13	-
B	7	8	15	A
C	5	10	15	A,B
D	8	9	16	C
E	14	25	30	D

5.2.   Draw an annotated diagram of a queuing system.   (8)

5.3.   You need to simulate the sales of crates of a chemical, the frequency of which is given in the table. Use the random number generated on Bb to generate the simulated sales for the first month:

(5)

Sales	1	2	3	4	5	6	7	8	9	10
Frequency	0.01	0.02	0.11	0.10	0.40	0.19	0.13	0.02	0.01	0.01

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