THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

JANUARY – APRIL 2014 TRIMESTER

FACULTY OF COMMERCE

DEPARTMENT OF ACCOUNTING AND FINANCE

REGULAR PROGRAMME

CMS 321: ANALYTICAL DECISION MAKING

Date: APRIL 2014   Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions

Q1. a) The Pfeiffer Company manages approximately K£15 million for clients. For each client Pfeiffer chooses a mix of three investment vehicles: a growth stock fund, an income fund, and a money market fund. Each client has different investment objectives and different tolerances for risk. To accommodate these differences, Pfeiffer places limits on the percentage of each portfolio that may be invested in the three funds and assigns a portfolio risk index to each client. Here's how the system works for Dennis Hartmann, one of Pfeiffer's clients. Based on an evaluation of Hartmann's risk tolerance, Pfeiffer has assigned Hartmann's portfolio a risk index of 0.05. Furthermore, to maintain diversity, the fraction of Hartmann's portfolio invested in the growth and income funds must be at least 10% for each, and at least 20% must be in the money market fund.

The risk ratings for the growth, income, and money market funds are 0.10, 0.05 and 0.01, respectively. A portfolio risk index is completed as a weighted average of the risk ratings for the three funds where the weights are the fraction of the portfolio invested in each of the funds. Hartmann has given Pfeiffer £300,000 to manage. Pfeiffer is currently forecasting a yield of 20% on the growth fund, 10% on the income fund, and 6% on the money market fund.

ISO 9001:2008 Certified by the Kenya Bureau of Standards

Required:

Develop a linear programming model to select the best mix of investments for Hartmann's portfolio. (NB. DO NOT SOLVE).

(10 marks)

b) IBM manufactures personal computers. The computers are manufactured at plants, A, B and C and shipped to five centers, W1, W_2, W_3, W_4 and W_5. The following table shows the number of computer available at each plant, the number of computers required by each warehouse, and the shipping costs (dollars per unit).

Plant	Warehouse					
	W1	W2	W3	W4	W5	Computers available
A	10	20	5	9	10	9,000
B	2	10	8	30	6	4,000
C	1	20	7	10	4	8,000
Computers required	3000	5000	4000	6000	3000	21,000

Required:

Determined the amount that should be shipped from each plant to each warehouse to minimize total shipping cost. Compute the minimal total shipping cost. **(8 marks)**

c) Ken J., the data processing manager for Stanbic Bank, is planning a project to install a new management information system. He is now needy to start the project and whishes to finish in 20 weeks. After identifying the 14 separate activities needed to carry out this project, as well as their precedence relationships and estimated durations (in weeks), Ken, has the following data:

ISO 9001:2008 Certified by the Kenya Bureau of Standards

Activity	Immediate predecessor	Activity duration (Weeks)
A	-	6
B	-	3
C	-	4
D	A	4
E	B	7
F	C	4
G	C	6
H	D	3
I	A	5
J	E	4
K	F	3
L	G	5
M	H, I, J	6
N	K, L	5

Required:

i) Construct the project network for this project and determine whether Ken will be able to meet his deadline if no delays occur. **(8 marks)**

ii) Which activities should Ken focus most of his attention on if he wants to stay on schedule? List the activities. **(2 marks)**

iii) What will be the duration of the project if activity I, H and J each takes 2 extra weeks. **(2 marks)**

Q2. a) An investment broker wants to invest up to Kshs. 200,000. She can purchase a type A bond yielding a 10% return on the amount invested and she can purchase a type B bond yielding 15% return on the amount invested. She also wants to invest at least as much in the type A bond as in the type B bond. She will invest at least Shs. 50,000 in the type A bond and no more than Shs. 80,000 in the type B bond.

Required:

    i)   Formulate a linear programming model that the investor can use to determine how much money she should invest in each type of bond in order maximize the return.   **(5 marks)**

    ii)   Solve the model by the graphical method.   What is the maximum return?   **(9 marks)**

b)   Explain the following special cases in the solution of linear programming models indicating their remedial measures or their implication to management decision making.

    i)   the case of alternative optimal solution.   **(2 marks)**

    ii)   the case of infeasibility   **(2 marks)**

    iii)   the case of an unbounded solution   **(2 marks)**

Q3.   Consider the following minimum – cost transportation problem:

Origin	Destination			Supply
	D_1	D_2	D_3	
O_1	4	10	6	100
O_2	8	16	6	300
O_3	14	18	10	300
Demand	200	300	200	

Required:

a)   Use the transportation simplex method to find an optimal solution and compute the minimum total transportation cost.   **(6 marks)**

b)   How would the optimal solution change if you must ship 100 units on the O_3 – D_3 route? Work out the problem and provide an optimal transportation plan with the minimum total cost. (NB: Provide an

ISO 9001:2008 Certified by the Kenya Bureau of Standards

appropriate stepping stone path to make the necessary adjustments to our solution in part b)   **(6 marks)**

c)   Because of wood construction, the O_2 – D_3 route is now unacceptable. Resolve the initial problem and provide an optimal transportation problem together with the minimum total transportation cost.   **(8 marks)**

Q4. a)   Bill, the managing director of LL Construction Company is considering placing a bid on a building project. Bill has determined that five tasks need to be performed to carry out the project. Using the PERT three – estimate approach, Bill has obtained the estimates in the table below for how long these tasks will take. Also shown are the precedence relationship for these tasks.

	Time required			
Task	**Optimistic estimate**	**Most likely estimate**	**Pessimistic estimate**	**Immediate predecessor**
A	3 weeks	4 weeks	5 weeks	-
B	2 weeks	2 weeks	2 weeks	A
C	3 weeks	5 weeks	6 weeks	B
D	1 week	3 weeks	5 weeks	A
E	2 weeks	3 weeks	5 weeks	B, D

There is a penalty of Shs. 500,000 if the project is not completed in 11 weeks. Therefore, Bill is very interested in how likely that his company could finish the project in time.

Required:

i)   Find the approximate probability of completing the project within 11 weeks (Assume the project completion time follows a normal probability distribution).   **(10 marks)**

ii)   Bill has concluded that the bid he would need to make to have a realistic chance of winning the contract would earn LL construction a profit of Shs. 250,000 if the project is completed within 11 weeks. Therefore he wants to place the bid if he has

at least a 50% chance of meeting the deadline. How would you advise him? **(3 marks)**

b) LL Construction company is ready to begin another project that must be completed in 12 months. The project has four activities (A, B, C, D). Bill has concluded that he cannot meet the deadline by performing all the activities in the normal way. Therefore, he has decided to use the CPM method of cost trade-offs to determine the most economic way of crashing the project to meet the deadline. He has gathered the following data for the four activities:

Activity	Immediate predecessor	Normal time (months)	Crash time (months)	Normal cost (Shs.)	Crash cost (Shs.)
A	-	8	5	Sh.2,500,000	4,000,000
B	-	9	7	2,000,000	3,000,000
C	A	6	4	1,600,000	2,400,000
D	B	4	4	2,700,000	4,500,000

Required:

Use trial and error to determine the optimal crashing decision for this small project. What is the total crashing cost? **(8 marks)**

END

ISO 9001:2008 Certified by the Kenya Bureau of Standards