



University Of Technology
Building and Construction Eng. Dept.
Final Exam –1st Attempt – 2014/2015
Subject :Management And
Economic of Water Resources
Branch : Water and Dams Eng.

Cass:4th Year
Time: 3 Hours
Date: | /6/2015



Answer Five Questions Only and the Marks are equally divided

Q1: Answer the followings:

- What are the procedures which should be applied in solving the non-linear optimization.
- What are the water resources data that should be collected in the evaluation of water resources basin.
- State the procedures of water system analysis

Q2: Three flood protections are to be allocated to avoid floods with unit of labors and materials as shown below:

Structures	Unit of Labors	Unit of Materials	Expected Protection
Reservoirs	1	3	350
Flood Plains	2	2	250
Levees	3	1	300
Available	30	60	----

Find the optimal protection by using simplex method .

Q3: Two power stations are wanted to be used to supply energy. The function of cost in (BID) is given by the following relation:

$$C = 50A + 70B$$

where: (A , B) are the types of power stations.

This function is related to discharge, head of water ,and the horsepower with the following restrictions:

- The discharge used is not more than (8 CUMS) and the two types used (2 , 3) CUMS respectively.
- The water head needed is not less than (12)m and the two types work on (6 , 8)m respectively.
- The produced horsepower is not more than (90)HP and the two types product (30,45) HP respectively.

Formulate and solve the problem to find the minimum cost .

Q4 :The irrigation water is to be conveyed to agricultural land by three canals . The cost of the conveying in (BID)was related to the discharge passing across them as shown in the following equations:

$$C_1 = 105Q_1^{-1.5}, \quad C_2 = 80Q_2^{-1.4}, \quad C_3 = 120Q_3^{-1.3}$$

The restriction in this project that the total discharge must not increase (100 CUMS).

Distribute the discharge on the canals to provide minimum cost of conveying.

Q5: A dam project was planning to find the optimal construction program. The project was divided into several activities as shown in table below:

Activity	Period (month)	Activity	Period (month)
1-2	4	4-7	12
1-3	10	5-6	6
2-4	8	6-8	4
2-5	7	7-9	13
3-4	4	8-9	8
4-5	6	*****	

The restrictions in this estimations contains:

1- The activity (3-4) begins after completing the activity (1-2).

2- The activity (7-9) begins after completing the activity (5-6).

Draw the diagram of planning the project and find the critical path, the early and later beginning of each activity in the project.

Q6: The water resources company want to construct (12) elevated semi-circular concrete canals. These canals are of different lengths and their total lengths are (54)Km. The cost of these canals in (1000)ID per meter length contains the following components (also per meter length):

1- The cost of supplying the canals from the factory is equal to (100 000)ID, and is varying directly with the cubic radius of it.

2- The cost of transporting the canals from the factory to their sites is equal to (10 000)ID, and is varying directly with their radius.

3- The cost of laying the canals is equal to (15 000)ID, and is varying with the inverse of their radius.

The rate of interest and depreciation for all above costs is (10%).

Find the optimal radius of canals which gives minimum cost, and then find the total cost of construction them

GOOD LUCK

(L)

(1) $z = c_1x_1 + c_2x_2 + \dots + c_nx_n$

Q1

- (A-) 1. find the number of variables (n)
 2. find the number of constraint functions (m)
 3. The objective function is:

$$\text{Maximize} = f(x_1, x_2, \dots, x_n)$$

Subjected to:

$$g_j(x) \geq 0, \quad j = 1, 2, \dots, m_1$$

$$g_j(x) = 0, \quad j = m_1 + 1, m_1 + 2, \dots, m_2$$

$$g_j(x) \leq 0, \quad j = m_1 + m_2 + 1, m_1 + m_2 + 2, \dots, m$$

If $f(x) = 0$ the problem is unfeasible

Always $m \geq n$ in non-linear optimization

13.)

- 1. Hydrology = the distribution of
 - Rainfall quantity & intensity, frequency
 - Rainfall runoff & infiltration
 - Hydrographs
 - Discharge analysis
 - Evaporation
 - Groundwater
- 2. Geology =
 - Rock formation
 - water holding capacity
- 3. Aerial photographs

- (C-) 1. State the objective of the problem
 2. Collection and analysis of data required
 3. Established the design criteria
 4. Suggest listing of alternative design
 5. Find the best design
 6. Evaluate the effect of the best design

(2)

Q.2: $P = 350X_1 + 250X_2 + 300X_3$

Subjected to:

10

$$X_1 + 2X_2 + 3X_3 \leq 30$$

$$3X_1 + 2X_2 + X_3 \leq 60$$

$$X_1 + 2X_2 + 3X_3 + S_a = 30$$

$$3X_1 + 2X_2 + X_3 + S_b = 60$$

	1	X_1	X_2	X_3
P	0	350	250	300
S_a	30	-1	-2	-3
S_b	60	-3	-2	-1

→

	1	S_b	X_2	X_3
P	10500	-350	-450	-750
X_1	30	-1	-2	-3
S_b	-30	1	4	8

10

$$P = 10500$$

$$X_1 = 30$$

$$X_2, X_3 = 0$$

To check:

$$P = 350 * 30 + 0 + 0 = 10500$$

∴ 0-K.

Q.3

$$C = 50A + 70B$$

$$2A + 3B \leq 8$$

$$6A + 8B \geq 12$$

$$30A + 45B \leq 90$$

$$6A + 8B = 12$$

