Sheet No (1)

(1) In a given year, a 10,000 km^2 watershed received 30 inches of precipitation. The average rate of flow measured in the river draining the area was 4,000 cfs.

Calculate the combined amounts of water evaporated and transpired from the region during this year?

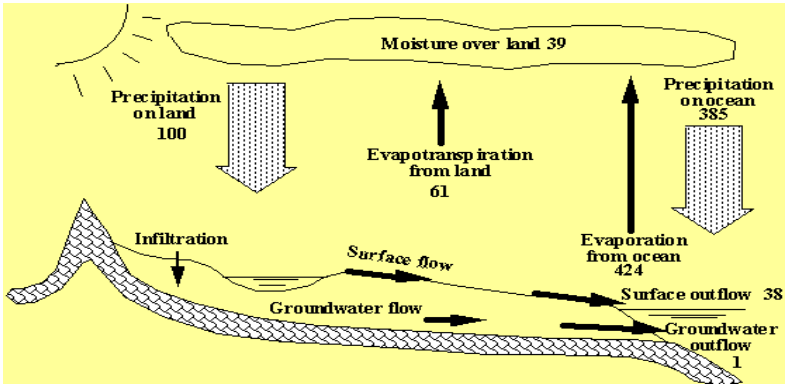
(2) In a given year, a catchment with an area of 2,500 km^2 received 1.3 m of precipitation. The average rate of flow measured in a river draining the catchment was 30 m^3/s.

a) How much total river runoff occurred in the year (in m^3)?
b) What is the runoff coefficient?
c) How much water is lost due to the combined effects of evaporation, transpiration, and infiltration? (Expressed in m)

(3) In the shown figure,
show the water balance:

a) In the atmosphere?

b) On the ocean?



(4) *From the Soil Texture Triangle:*

a) Find the soil texture for the combination 20% sand, 60% silt, 20% clay?

b) State the soil texture for the combination 5% sand, 80% silt?

(5) An area of clayey soil has a specific weight of 1.28 gm/cm^3, a field capacity of 28 % and a wilting point of 15 %. The area is cultivated by a crop that requires 12.5 m^3/day of water per Feddan in March, when its effective root depth is 40 cm.

a) If the field losses are 50 %, determine the field irrigation requirements?

b) Calculate the maximum period between irrigation processes?
c) If the on -interval is 6 days, determine the water duties for the field and the distributor canal?

(6) An area is cultivated by a crop that requires 14 m^3/Feddan/day of water. There is a rainfall with a rate of 1.5 mm/day and the field losses are 50 %.

a) Determine the field irrigation requirements?
b) Re-solve the problem when there is no rainfall?
c) What is your comment on these results?

(7) A branch canal of 12.5 km length serves an area of 23,000 Feddan and feeds six distributor canals, *as shown in the following table:*

Name	Km	Location	Area Served, Feddan
C1	1.0	Left	4,000
C2	3.0	Right	3,000
C3	5.0	Left	5,000
C4	7.0	Right	3,500
C5	9.0	Left	4,500
C6	11.0	Right	2,000

Draw a diagram for the branch canal with its distributaries *in the cases:*

a) No irrigation rotation.
b) Two turn irrigation rotation.
c) Three turn irrigation rotation.

(8) A main canal in Upper Egypt serves a total area of 90,000 feddans by three branch canals: B1 serves 27,500 feddans, B2 serves 33,500 feddans and B3 serves 29,000 feddans. This area is cultivated as follows: 40 % cotton, 55 % sharaki (prepared for cultivating maize) and the rest 5 % is used for the public services.

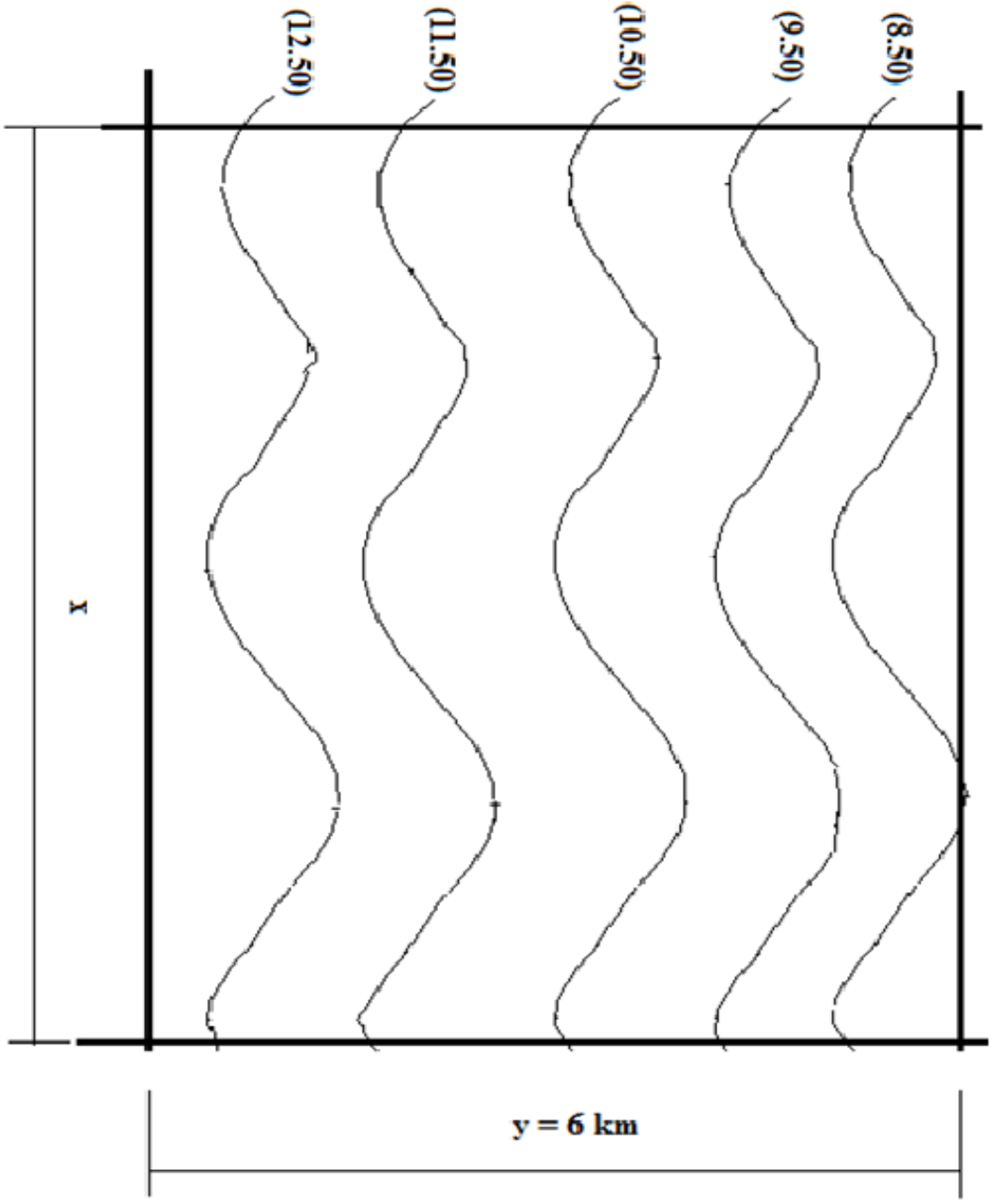
a) Sketch a diagram for performing the suitable irrigation rotation?
b) Calculate the maximum and the minimum discharges passing through the head regulator of the main canal?
c) If the three branch canals have equal area served, resolve no (b)?
d) Determine the discharge passing through the main drain serving the area?

Sheet No (2)

(1) The shown area is 12,000 feddans, and is bounded by four roads.

a) If the vertical distance (y) is 6 km, determine the horizontal distance (x)?

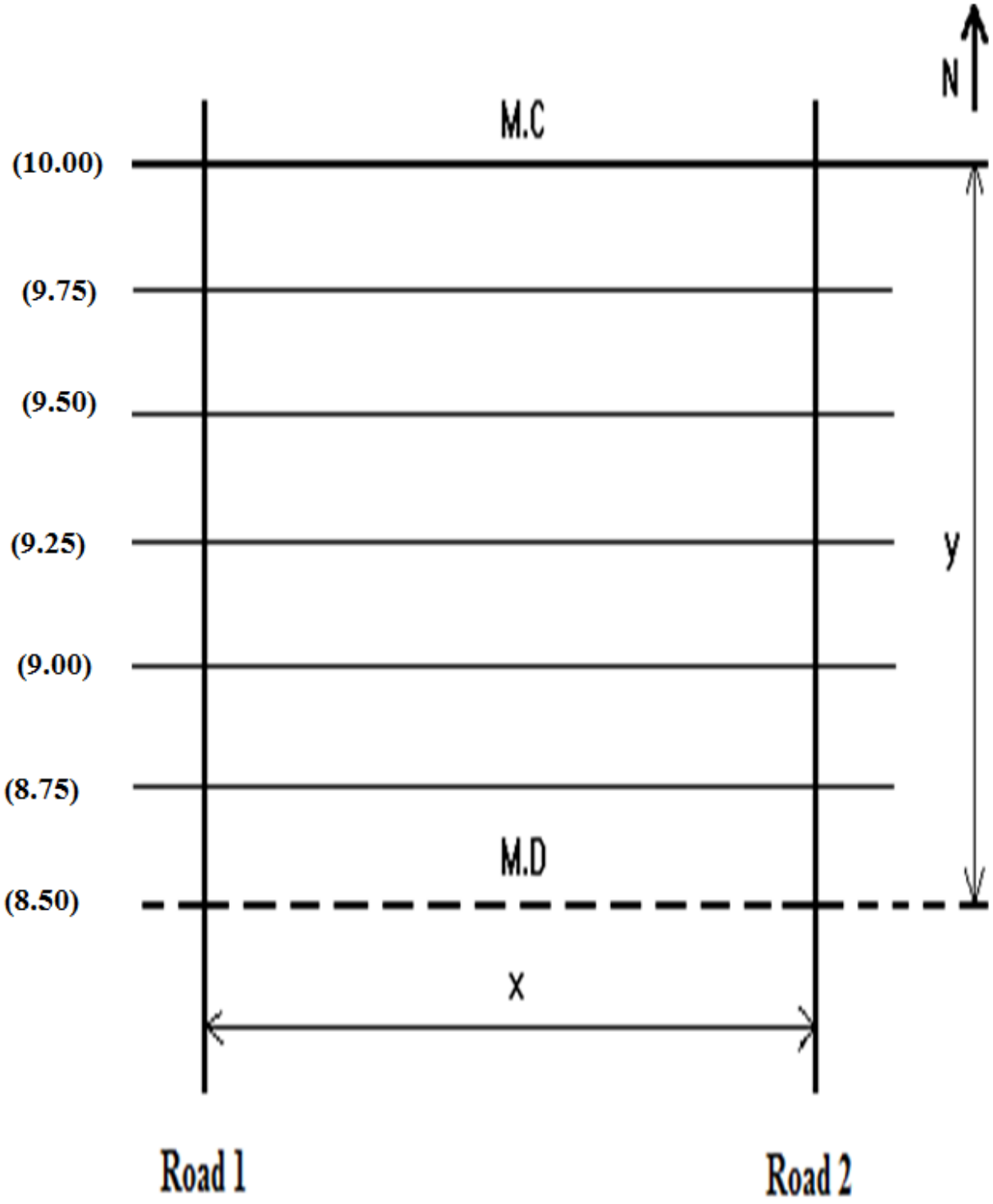
b) Plan the irrigation and drainage networks required to serve this area?



(2) An area of 7,500 Feddans is shown in the figure.

a) If the vertical distance between the main canal and the main drain (y) is 6 km, determine the horizontal distance (x) between the two roads?

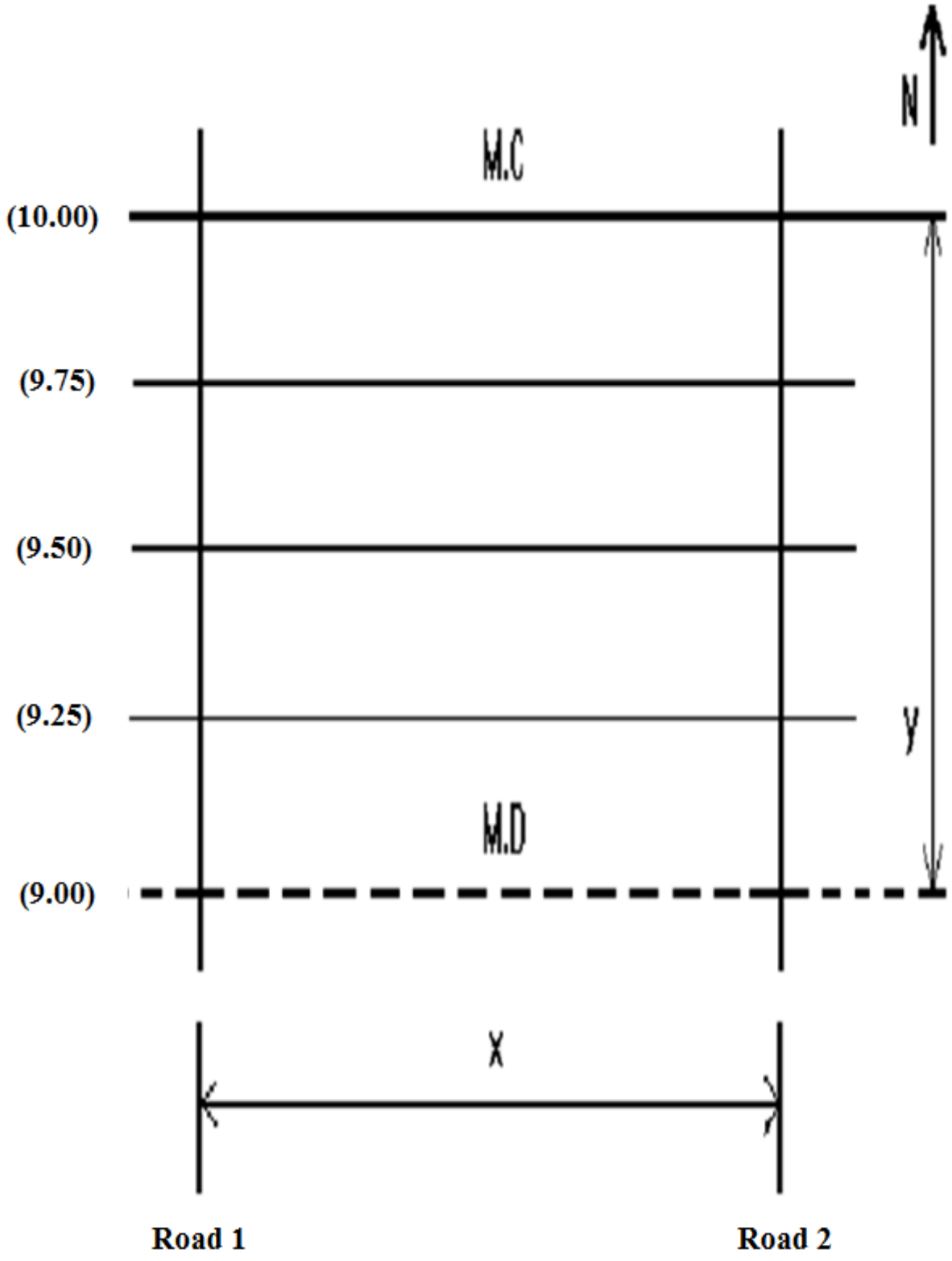
b) Plan the irrigation and drainage networks required to serve this area?



(3) An area of 40,000 Feddans is shown in the figure.

a) If the vertical distance between the main canal and the main drain (y) is 16 km, determine the horizontal distance (x) between the two roads?

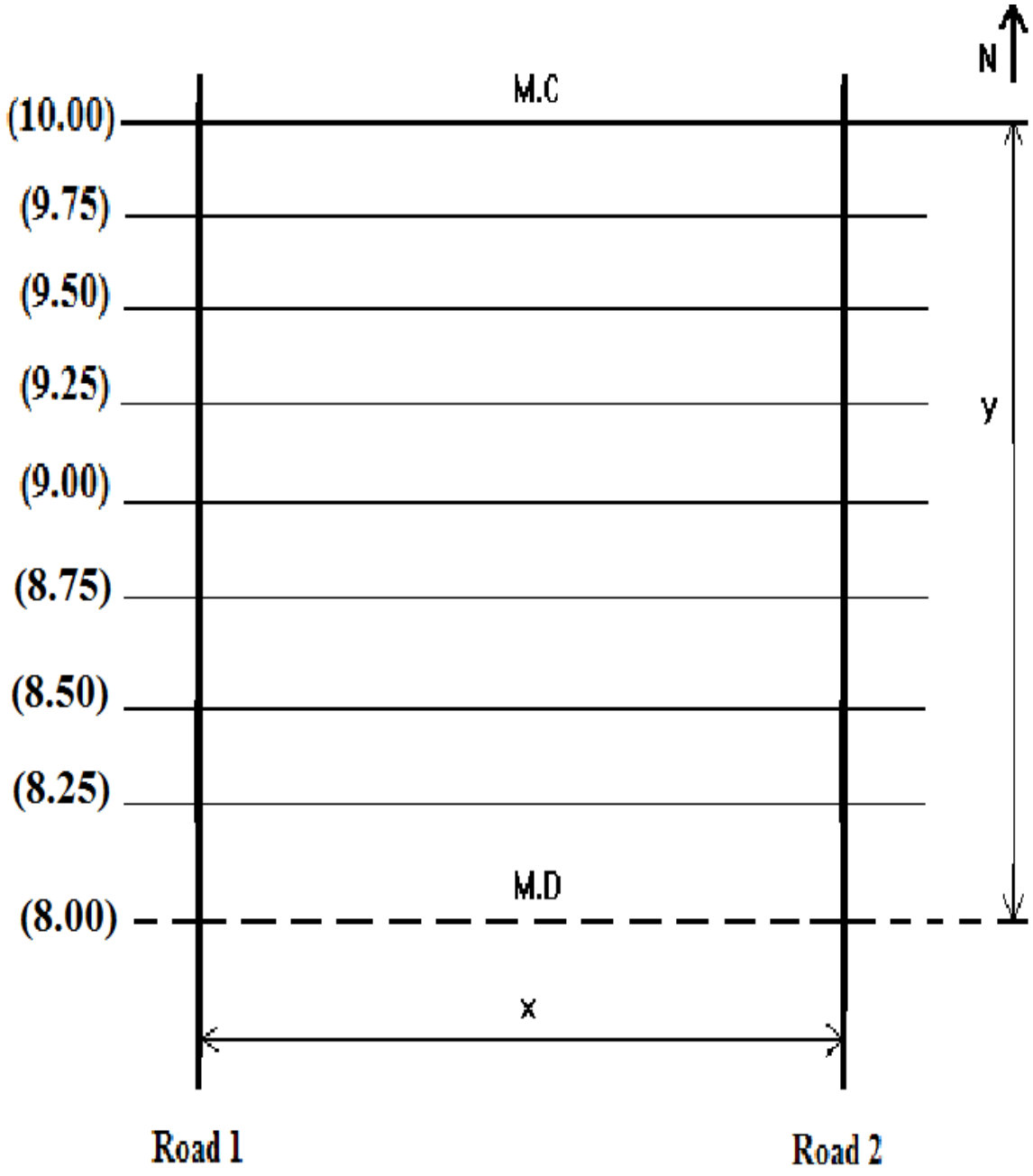
b) Plan the irrigation and drainage networks required to serve this area?



(4) An area of 40,000 Feddans is shown in the figure.

a) If the vertical distance between the main canal and the main drain (y) is 16 km, determine the horizontal distance (x) between the two roads?

b) Plan the irrigation & drainage networks required to serve this area?



Sheet No (3)

(1) A branch canal has a length of 12 km, serves an area of 12,000 feddans, and the land level is (9.40) at the Km 12.0. FWD = 50 m^3/day/feddan.

Distributor Canal	Location	Area Served (Fed)	Land Levels for Distributaries at Km:				
			0.0	1.0	2.0	3.0	4.0
C 1	0.0, L	4,000	(11.00)	(11.00)	(10.80)	(10.70)	(10.75)
C 2	4.0, R	2,500	(10.45)	(10.55)	(10.35)	(10.25)	---
C 3	9.0, L	3,500	(9.75)	(9.60)	(9.45)	(9.30)	---

a) Sketch a plan for the branch and distributor canals for two-turn irrigation rotation?
b) Draw the synoptic diagram for the branch and distributary canals for an average 50 cm lift irrigation?

(2) A branch drain is 13 km long and serves an area of 17,000 Feddans.

Minor Drain	Location L: Left R: Right	Area Served, Fed	Land Levels for Minor Drains at Km				
			0.0	1.0	2.0	3.0	4.0
D 1	2.0, L	4,000	(8.75)	(8.85)	(8.75)	(8.75)	(9.05)
D 2	4.0, R	3,500	(8.75)	(9.00)	(9.25)	(9.50)	(9.75)
D 3	7.0, L	5,500	(8.80)	(9.25)	(9.50)	(9.75)	(10.00)
D 4	11.5, R	2,000	(9.10)	(9.40)	(9.65)	(9.85)	---
---	13.0	---	(10.20)	---	---	---	---

a) Sketch a plan for the branch and minor drains?
b) Draw the synoptic diagram for the branch and minor drains?
c) Find the suitable water level in the main drain receiving the branch drain?

Sheet No (4)

(1) *For problem (1) sheet no (3):*

1) Calculate the area served for design at different sections of the branch canal, where the compensation ratio is 30 %?
2) Design the best hydraulic cross section at km 6.0 of the branch canal, Z = 3/2?
3) Check the velocity giving your comment?
4) Design the non silting non scouring cross section at km 6.0 of the branch canal, Z = 3/2?
5) Draw the typical cross section showing the expropriation width, if the land level is (10.15) m?
6) Determine the length of this section?
7) Calculate the quantities of cut and fill?
8) Draw a complete longitudinal section for the branch canal?

(2) *For problem (2) sheet no (3):*

1) Calculate the area served for design at different sections of the branch drain?
2) Design the best hydraulic cross section at km 3.0 of the branch drain, Z = 1?
3) Check the velocity giving your comment?
4) Design the non silting non scouring cross section at km 3.0 of the branch drain, Z = 1?
5) Draw the typical cross section showing the expropriation width?
6) Determine the length of this section?
7) Find quantities of cut and fill?
8) Determine only the discharge passing in the cross section of the minor drain D2 at its outfall?
9) Draw a complete longitudinal section for the branch drain?