Benha University
Faculty of Engineering at Shoubra
Civil Engineering Department
Third Year Civil, General

Final 1st Term Exam
Date: 3 / 1 / 2018
Irrigation & Drainage Engineering
CVG 325
Duration: 3 hours

- Answer all the following questions.
- Illustrate your answers with sketches when necessary.
- The exam consists of 2 pages.
- No. of Questions: 4
- Total Mark: 100 Marks

Question (1) **(20 Marks)**

State True or False & Correct the False:

1) In semi-arid regions, the available rainfall is not sufficient for the plants' growth.
2) The total volume of water in the world is varying due to climate changes.
3) Hygroscopic water is useful for the plant.
4) Capillary water is useful for the plant.
5) Excess water in the soil is the moisture above W.P.
6) Irrigation rotations increase the irrigation efficiency.
7) Two partial regulators are required for two-turn irrigation rotation.
8) Sharaki is not suitable for two-turn irrigation rotation.
9) Two-turn irrigation rotation must be used when cotton is cultivated.
10) Every canal has to end into a drain.

Question (2) **(30 Marks)**

A branch canal is 13 km long and serves an area of 13,000 feddans. The area is cultivated as: 40 % rice, 55 % sharaki (prepared for cultivating maize). The land level is (9.50) at Km 13.0.

Distributor Canal	Location	Area Served (Fed)	Land Levels for Distributor Canals at Km: 0.0	1.0	2.0	3.0
C 1	1.0, L	3,000	11.00	11.00	10.80	10.70
C 2	6.0, L	4,000	10.45	10.55	10.35	10.25
C 3	9.0, L	4,000	10.15	10.00	9.85	9.70

1) Sketch a diagram for performing the suitable irrigation rotation?
2) Draw the synoptic diagram for the branch canal and its distributors for lift irrigation?
Water levels for the branch canal are: **(10.65) at km 1.0, (10.25) at km 6.0, and (9.80) at km 9.0.**
3) Calculate the discharges at different sections of the branch canal, (compensation ratio = 20% & F.W.D. = 50 m^3/Fed/day)?
4) Design the cross section of the branch canal, (Q = 4.53 m^3/s, i = 10 cm/km, Z = 1 & b = 2 y)?
5) Discuss the velocity at the designed section of the branch canal (Q = 4.53 m^3/s)?

Question () **(Marks)**

Examiners Board: ***Dr. Alaa El-Hazek, Dr. Neveen Badawy***

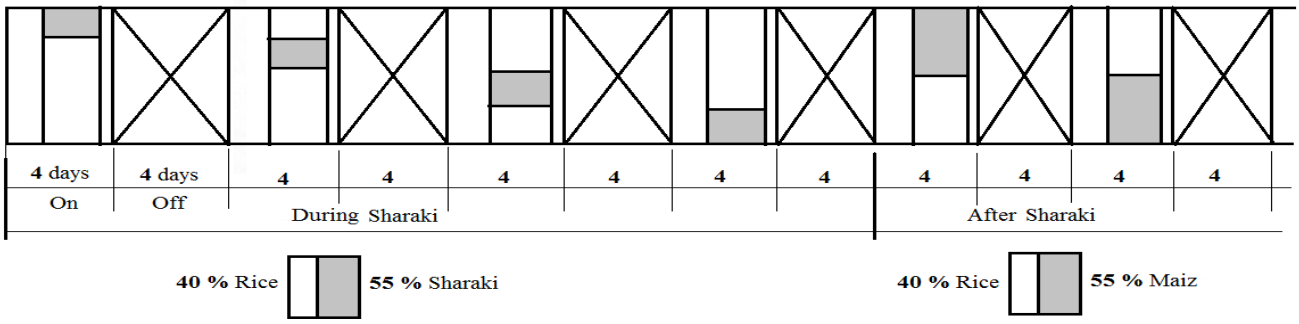
A Model Answer **Final 1st Term Exam** **3 / 1 / 2018**

Question (1) **(20 Marks)**

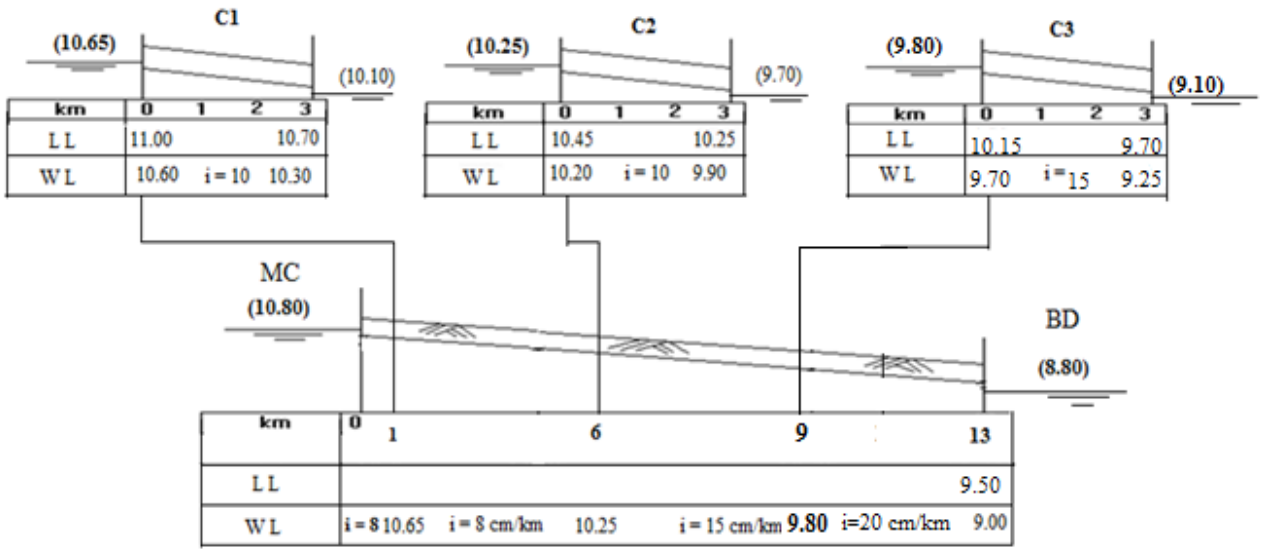
No	The Statement	T / F	Correction
1	In semi-arid regions, the available rainfall is not sufficient for the plants' growth.	T	--
2	The total volume of water in the world is varying due to climate changes.	F	constant
3	Hygroscopic water is useful for the plant.	F	not useful
4	Capillary water is useful for the plant.	T	--
5	Excess water in the soil is the moisture above W.P.	F	F.C.
6	Irrigation rotations increase the irrigation efficiency.	T	--
7	Two partial regulators are required for two-turn irrigation rotation.	F	One
8	Sharaki is not suitable for two-turn irrigation rotation.	F	suitable
9	Two-turn irrigation rotation must be used when cotton is cultivated.	F	rice
10	Every canal has to end into a drain.	T	--

Question (2) **(30 Marks)**

1. *A diagram for performing the two - turn irrigation rotation:*



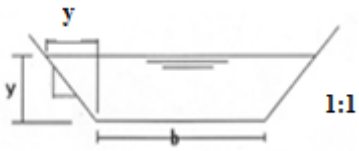
2. *Synoptic diagram for the branch canal and its distributors for lift irrigation:*



3. *The area served for design at the different sections of the branch canal:*

Sec.	Location, Km	Area Served, Fed		AS + Comp., Fed		AS_{design} Fed	Discharge, m^3/s $Q=AS_{Design}*\frac{(50*1.15)}{24*60*60}$
		Turn, A	Turn, B	A+0.2B	B+0.2A		
1	1.0	7,000 4,000	6,000 6,000	8,200 5,200	7,400 6,800	8,200 6,800	5.46 4.53
2	6.0	4,000 ---	6,000 6,000	5,200 1,200	6,800 6,000	6,800 6,000	4.53 3.99
3	9.0	--- ---	6,000 2,000	1,200 400	6,000 2,000	6,000 2,000	3.99 1.33

4. *Design the cross section of the branch canal:*



$Q = 4.53\ m^3/sec$

Trapezoidal section, $z = 1$ $\therefore z:1 = 1:1$

$A = b\,y + [2 * (1/2) * y * y] = b\,y + y^2$

& $P = b + 2\,(y^2 + y^2)^{1/2} = b + 2.83\,y$

$b = 2\,y$ $\therefore A = 2\,y^2 + y^2 = 3\,y^2$

& $P = 2\,y + 2.83\,y = 4.83\,y$

$\therefore R = \frac{A}{P} = \frac{3\,y^2}{4.83\,y} = 0.62\,y$

$Q = A * v = (1/n) * R^{3/2} * S^{1/2} * A$

$S = i = 10 / 10^{-5}$ & $1 / n = 40$

$4.53 = 40*(0.62)^{2/3} * y^{2/3} * (10*10^{-5})^{1/2} * 3\,y^2$

$\therefore y^{8/3} = 5.193$ $\therefore y = 1.85\ m$ $\therefore b = 3.71\ m$

Take $b_m = 4\ m$

$A_{calculated} = A_m$

$\therefore b\,y + y^2 = b_m\,y_m + y_m^2$

$(3.71*1.85) + (1.85)^2 = 4\,y_m + y_m^2$

$y_m^2 + 4\,y_m - 10.29 = 0$

$y = \frac{-b \pm [(b)^2 - (4*a*c)]^{1/2}}{2*a}$

$\therefore y_m = \frac{-4 \pm [(4)^2 - (4*1*-10.29)]^{1/2}}{2 \times 1}$ $\therefore y_m = 1.78\ m$

5. *Velocity at the designed cross section of the branch canal:*

$v = Q / A = 4.53 / 10.29 = 0.44\ m/s$

$0.3 < v < 0.9$

The velocity is non-silting non-scouring