Kafr El-Sheikh University	Open Channel Hydraulics
Faculty of Engineering	Final term exam.
Civil Engineering Dept.	Date: January, 2016
Third year	Time : 3 hour

Answer all the following five questions

Any other required data may be reasonably assumed. الامتحان مكون من في صفحتين

Question No. (1) [15%]

A **rectangular** channel having bed width of 8.0 m and water depth of 2m carries a discharge of12 m^3/sec. There is a **transition** to **trapezoidal** channel having bed width = 7m and side slope = 1:1. The transition is **accompanied by increasing** the channel bed level by **1.5** m, calculate the change in water surface levels.

Question No. (2) [30%]

a) A **rectangular** channel of bed width 10 m has a discharge of 9 m^3 /sec, bed slope (S_1) = **0.0004** and Manning coefficient, n = 0.02. If the bed slope is changed to (S_2) = **0.0002** as shown in Fig.(1), calculate the **length of nonuniform flow upstream** and **downstream** the breaking point (A). **[20%]**

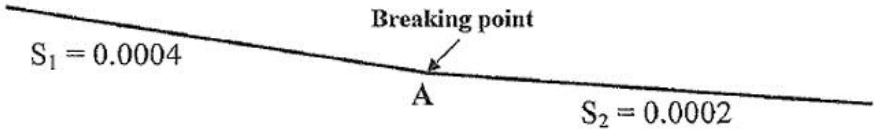

Fig. (1)

b) Sketch the water surface profiles of G. V. F. in the following changes in bed slopes: **[10%]**

1) Mild slope to steeper mild slope 2) Steep slope to steeper steep slope

3) Steep slope to critical slope

Question No. (3) [15%]

Water flows at a velocity of 20 ft/sec. at a depth of 3 ft at a rectangular channel of bed width 20 ft. Calculate the **sequent depth** of a hydraulic jump occurred at this channel, then find the **head losses** through the hydraulic jump. باقي الأسئلة في الخلف

Question No. (4) [20%]

Design a **stable** hydraulic section that conveys 400 cfs, n = 0.025, permissible tractive force = 0.5 Ib/ft^2, S = 0.0016, and angle of internal friction (ϕ) = 33.5°. Also, it is required to draw the cross section.

$$y_o = \frac{\tau_o}{0.97\gamma S}, \quad y = y_O \cos\left(\frac{\tan\phi}{y_o}x\right), \quad T'' = \frac{n\left(Q_{given} - Q_{cal.}\right)}{1.49 y_o^{5/3} . S^{1/2}}$$

$$V = \frac{(1.35 - 1.19\tan\phi)}{n} y_o^{2/3} S^{1/2}, \quad A = \frac{2.04\, y_o^2}{\tan\phi} \quad T' = 0.96\left[1 - \sqrt{\frac{Q_{given}}{Q_{cal.}}}\right]T$$

Question No. (5) [20%]

Two tanks **A** and **B** are connected by a pipe of length 5000m, diameter 0.8m, λ = 0.025. A pump is used to **lift** water from the tank **A to** the tank **B** where tank **B** is **higher** than reservoir **A** by **20** m. The characteristics of the pump are shown in the following table for **N = 400** rpm and **diameter (D) = 30cm,** calculate the **discharge** passing through the pipe in the following two cases:

a) **two** pumps in **series** using **N = 300** rpm and **diameter (D) = 30cm**

b) **two** pumps in **parallel** using **N = 400 rpm** and **diameter (D) = 40cm**

H (m)	30	27	24	18	12	6
Q (Lit/sec)	0	6.9	11.4	15.8	18.9	21.5

GOOD LUCK