Kafr El-Sheikh University		Open Channel Hydraulics (CES3119)
Faculty of Engineering		Final term exam.
Civil Engineering Dept.		Date: January, 2017
Third year civil		Time : 3 hour
Examiner: Associ. Prof. Moustafa El-Enany		Full mark: **125** marks

Answer all the following five questions

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

Question No. (1) [19 marks]

Check the dimensions (for **stability** and **suitability of discharge**) of a trapezoidal open channel section according to the following data: $\tau_{b\,max.} = 0.97\,\gamma\,y\,s$, $\tau_{s\,max.} = 0.75\,\gamma\,y\,s$, bed width = 6 m , side slope = 2:1, water depth = 1 m , $d_{50} = 2.5$ mm , bed slope = 8 cm /km , $\gamma_{soil} = 1.8$ t/m^3 , angle of repose = 35°, **required discharge** = **2.5 m^3/sec**, Manning coefficient (n) =0.02.

Question No. (2) [24 marks]

A **rectangular** channel of bed width of 10m carries a discharge of 10 m^3/sec at a depth of 2m, calculate the **change in water levels** in the following two cases::

    a- The bed **level** is increased by a **hump of 1.5m**   **[12 marks]**

    b- The bed width is **contracted to 5m.**   **[12 marks]**

Question No. (3) [20 marks]

A **model** of a **dam** is to be built according to the following data:

Prototype data: dam length = 300m , water depth = 10m, length of backwater curve is approximately 60 km, discharge = 1000 m^3 /sec,

Available laboratory data: flume length = 30m, flume width = 1.5m, flume depth = 1m, pump discharge = 0.5 m^3/sec.

   It is required to determine the scale(s) of the model.

(باقى الاسئلة فى الخلف)

Question No. (4) [24 marks]

Two tanks A and B are connected by a pipe of length 5000m, diameter 0.2m, λ = 0.025. A pump is used to **increase** the discharge from **tank A to tank B**, where **tank A is higher than tank B by 10 m**. The characteristics of the used pump are shown in the following table for **N = 350 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**   [12marks]

b) **two pumps in parallel** using **N = 400 rpm** and **diameter (D) = 35cm** [12marks]

H (m)	30	25	21	17	11	5
Q (Lit/sec)	0	27	35	44	54	64

Question No. (5) [38 marks]
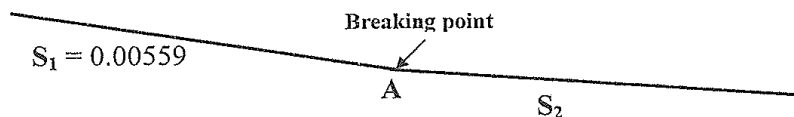
a) Sketch the water surface profiles of G. V. F. in the following changes in bed slopes: **[12 marks]**

1) Mild slope to critical slope   2) Steep slope to milder steep slope

3) Critical slope to Steep slope

b) A **rectangular** channel of bed width 10 m has a discharge of 10 m³ /sec, bed slope (S_1) = **0.00559** and Manning coefficient, n = 0.02. If the bed slope is changed to (S_2) as shown in Fig.(1), it is required to :

1) calculate the value of the **second slope (S_2)** which **creates hydraulic jump upstream or downstream the breaking point A.**   **[8 marks]**

2) If the value of the second slope (S_2) = **0.00051**, calculate the length of nonuniform flow **upstream and downstream** the breaking point (A).

Breaking point

$S_1 = 0.00559$

A

S_2

M. El-Enany   Fig. (1)   **GOOD LUCK**