

Kafr El-Sheikh University
Faculty of Engineering
Civil Engineering Dept.
Third year civil



Open Channel Hydraulics (CES3119)
Final term exam.
Date: 24 december, 2017
Time : 3 hour
Full mark: 125 marks

Answer all the following five questions

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

Question No. (1) [24 marks] (A13, B2, C1)

Design a stable hydraulic section that conveys 200cfs, $n = 0.03$, permissible tractive force $(\tau_o) = 0.4 \text{ lb/ft}^2$, bed slope $(S) = 0.0012$, angle of internal friction $(\phi) = 30^\circ$,

$$V = \frac{1.35 - 1.19 \tan \phi}{n} y_o^{2/3} S^{0.5}, \quad y_o = \frac{\tau_o}{0.97 \gamma S}, \quad y = y_o \cos \left(\frac{\tan \phi}{y_o} x \right)$$

$$A = \frac{2.04 y_o^2}{\tan \phi}, \quad T' = \frac{n(Q_{\text{given}} - Q_{\text{calculated}})}{1.49 y_o^{5/3} S^{0.5}}, \quad T' = 0.96 T \left[1 - \sqrt{\frac{Q_{\text{given}}}{Q_{\text{calculated}}}} \right]$$

Question No. (2) [16 marks] (A13, B2, C1)

A **rectangular** channel of bed width of 5m carries a discharge of $10 \text{ m}^3/\text{sec}$ at a depth of 0.5m, calculate the **change in water levels** in the following two cases::

a- The bed **level** is decreased by a **depression** of 1.0 m [8 marks]

b- The bed width is **expanded** to 6m. [8 marks]

Question No. (3) [20 marks] (A13, B14, C1)

A **model** of a **dam** is to be built with horizontal scale $(L_H) = 1:2000$ and vertical scale $(L_V) = 1:20$ according to the following data:

Prototype data: dam length = 200m, water depth = 10m, length of backwater curve is approximately 10 km, discharge = $1000 \text{ m}^3/\text{sec}$,

It is required to determine the **flume dimensions** and **pump discharge** in the laboratory.

(باقى الاسئلة فى الخلف)

Question No. (4) [25 marks] (A13, B14, C1)

A pump station across a waterway used 6 pumps as shown in Fig. (1). The characteristic table of the used pump are shown in the following table for $N = 350$ rpm and diameter $(D) = 30\text{cm}$. It is required to get the characteristic table for the used 6 pumps for $N = 300$ rpm and diameter $(D) = 35\text{cm}$

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

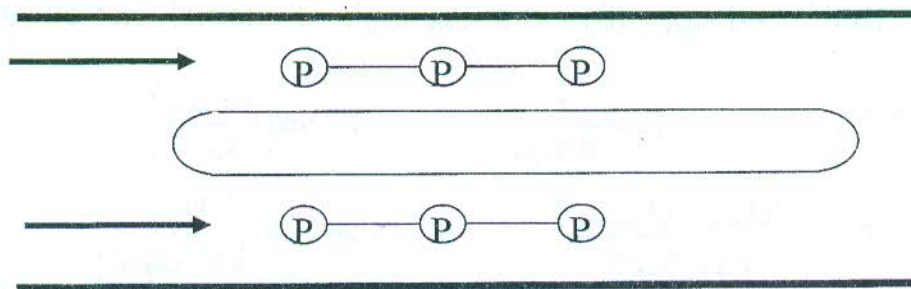


Fig. (1) Plan of a pump station

Question No. (5) [40 marks] (A13, B14, C7)

a) Sketch the water surface profiles of G. V. F. in the following changes in bed slopes: [8 marks]

- 1) Mild slope to Steep slope
- 2) Steep slope to Steeper steep slope
- 3) Critical slope to Mild slope

b) A **rectangular** channel of bed width 10 m has a discharge of $8 \text{ m}^3 / \text{sec}$, bed slope $(S_1) = 0.0153$ and Manning coefficient, $n = 0.02$. If the bed slope is changed to (S_2) as shown in Fig.(2), it is required to :

- 1) Calculate the value of the **second slope (S_2)** which **does not create any nonuniform (varied) flow upstream the breaking point A**. [12 marks]
- 2) If the value of the second slope $(S_2) = 0.001$, calculate the length of **nonuniform flow upstream and downstream the breaking point (A)**.

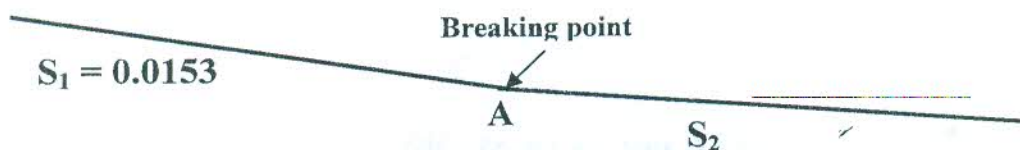


Fig. (2)

GOOD LUCK