



Subject: **Hydraulic Structures**  
Class: **Fourth year**  
Examiner: **Prof. Dr.Saleh I. Khassaf**

Exam: Final  
Time: Three hours  
First attempt/2016- 2017

Attempt **All** Questions

**Q.1] ( 10%+10%=20%)**

**A: Given the following data for a hydraulic structure:**

**u.s.w.l.=120m , b.l.=115m , length of the floor=51m ,density of the concrete for the floor=2400 kg/m<sup>3</sup> , the gate at distance 15m from the upstream end , depth of cut-off 5m at downstream end .Calculate the thickness under the gate using Khosla's theory and draw the uplift pressure diagram.**

**B: A head regulator at discharge 8 cumecs with upstream water depth 3m and downstream water depth 2.8m, the area of water way is 6m<sup>2</sup> . If  $C_d = 0.82$ . Find: (a) The velocity head . (b)High opening of the regulator.**

**Q.2] (15%)**

**Two concrete pipes ( $n=0.01$ ) must carry the flow from an open channel half square section 2m wide and 1m deep ( $n=0.01168$ ). The slope of both structures is (0.0009) . Determine the diameter of the pipes.**

**Q.3] (20%)**

**A concrete box culvert at two opening (2x3)m and (2x2)m. If the pieces of precast concrete with length 2.5m are used in this structure , the total head of the culvert is 0.2m with total length 30m . If  $k_1=0.3$  and  $k_2=1$ . Find the discharge of the structure with sketch, also find the number of the precast pieces which you need of the structure. Assume any suitable value to solve the problem.**

**Q.4] (15%)**

**Design a sliding steel gate for a barrage , if the stiffeners have an elastic modulus section equal to 500 cm<sup>3</sup> , the clear water way of the barrage is 71.25m with 19 opening. each gate at height five meters, using  $f_s=10000$  ton/m<sup>2</sup>.**

**Q.5] (15%)**

**A canal at triangular cross section with discharge 0.3 cumecs , if the depth of water 0.15m , the side slope of canal 2:1 . Is the hydraulic jump will form or not, if so, calculate the properties of the jump.**

**Q.6]( 7%+8%=15%)**

**A- In major hydraulic structures cut-off walls used either one cut-off at upstream end of the floor or one cut-off at the downstream end or two cut-offs at both ends. Explain with sketches the functions and advantages of them for each position.?**

**B- Answer the following questions:**

**1-If a hydraulic structure has a lane coefficient equal( 5 ) .**

**Is the structure safe against undermining in the south of Iraq.?**

**2-What do you mean of crossing structures ? How to select each one .?**

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**With my best wishes**

**Prof. Dr. Saleh I. Khassaf  
Examiner**

**Asst. Prof. Dr. Wisam S. Al-Rekabi  
Head of the Department**

