iii. **Draw** the factor of safety diagram against piping along the exit face, using at least two points (G_s = 2.65 t/m^3 & e = 0.65). **(3 marks)**

iv. **Check, using sketches only,** the effect of each of the **visible crack at (C-C)** and the **leaky joint (J-J)** on the **uplift pressure**. **(4 marks)**

4. **Using a suitable scale and assuming any missing data,** draw a **longitudinal section** of the weir showing all details. **(5 marks)**

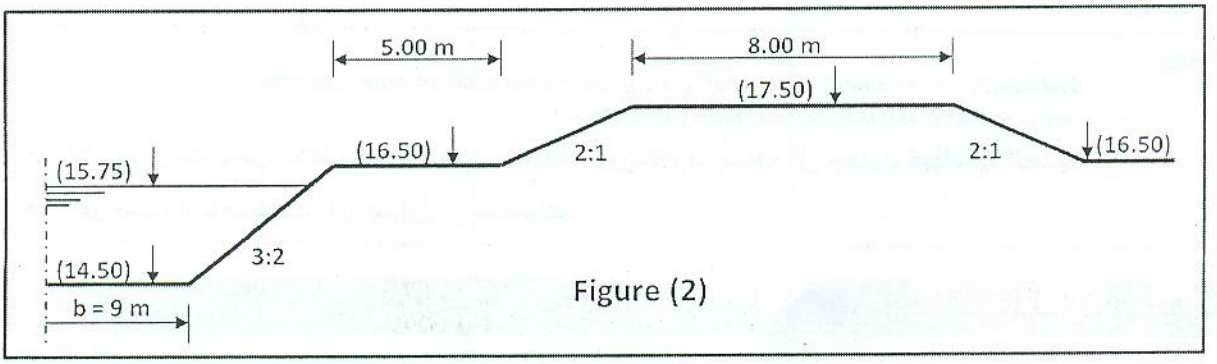


Figure (2)

Question No. 2 (25 Marks)

A. **Distinguish,** using neat sketches, between constructing **a head regulator with – and without an approach channel.** **(5 marks)**

B. Without any calculations and using neat sketches, **give** the required steps to design a **plain concrete regulator pier** for only **one case of loading of live loads.** **(5 marks)**

C. A control regulator is to be constructed across a main canal. The regulator has **three vents**; each vent is **5 m span**. The maximum passing discharge is **120 m^3/sec.**, and the canal cross section downstream the regulator is shown in Figure (3). A **plain concrete pier** is used; its width is **1.5 m**. The used gates are vertical sliding gate type; each gate has **four horizontal main girders** and **three intermediate vertical cross girders. It is required to:**

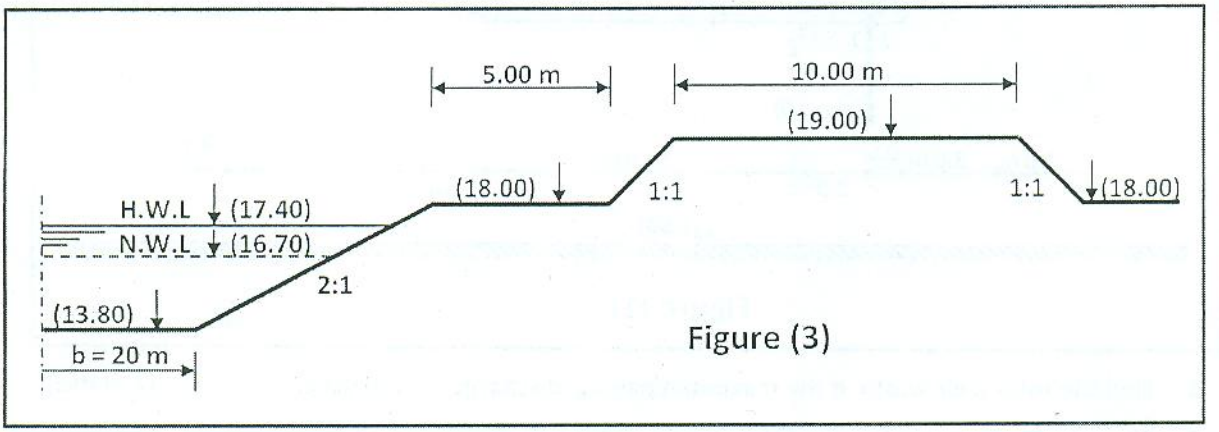


Figure (3)

1. **Check** the hydraulic design of the regulator. **(4 marks)**
2. **Find** the skin plate thickness of the gate. **(4 marks)**
3. **Find** the required section of the main girder of the gate. **(3 marks)**
4. **Find** the total number of rollers for each gate. **(2 marks)**

5. **Find** the required section of the slot channels of the gate lifting structure. (2 marks)

Question No. 3 (25 Marks)

A. **List**, using a neat sketch, the main elements of **a symmetrical navigation lock**. (4 marks)

B. **Distinguish**, using neat sketches, between:

1. **Drop** and **chain** locks. (2 marks)
2. **Two-way** and **double mitre gates** locks. (2 marks)
3. **Sluice gate** and **side culverts.** (2 marks)

C. Figure (4) shows the cross section of a plain concrete unsymmetrical lock. The lock chamber dimensions are 17 x 120 ms, the upstream and downstream high water levels are (16.20) and (13.50), respectively. The soil bulk density = 1.80 t/m^3 and the angle of internal friction = 30°. **For the case of empty lock chamber it is required to:**

1. **Check** the side culverts dimensions, if the time for filling is **8** min. (3 marks)
2. **Drive** the stresses distribution for **section (I – I)** of the **landing wall.** (6 marks)
3. For the **guide pier, check** the pier stability against **sliding** and **overtopping** – and **check** the **stresses** at **section (II – II).** (6 marks)

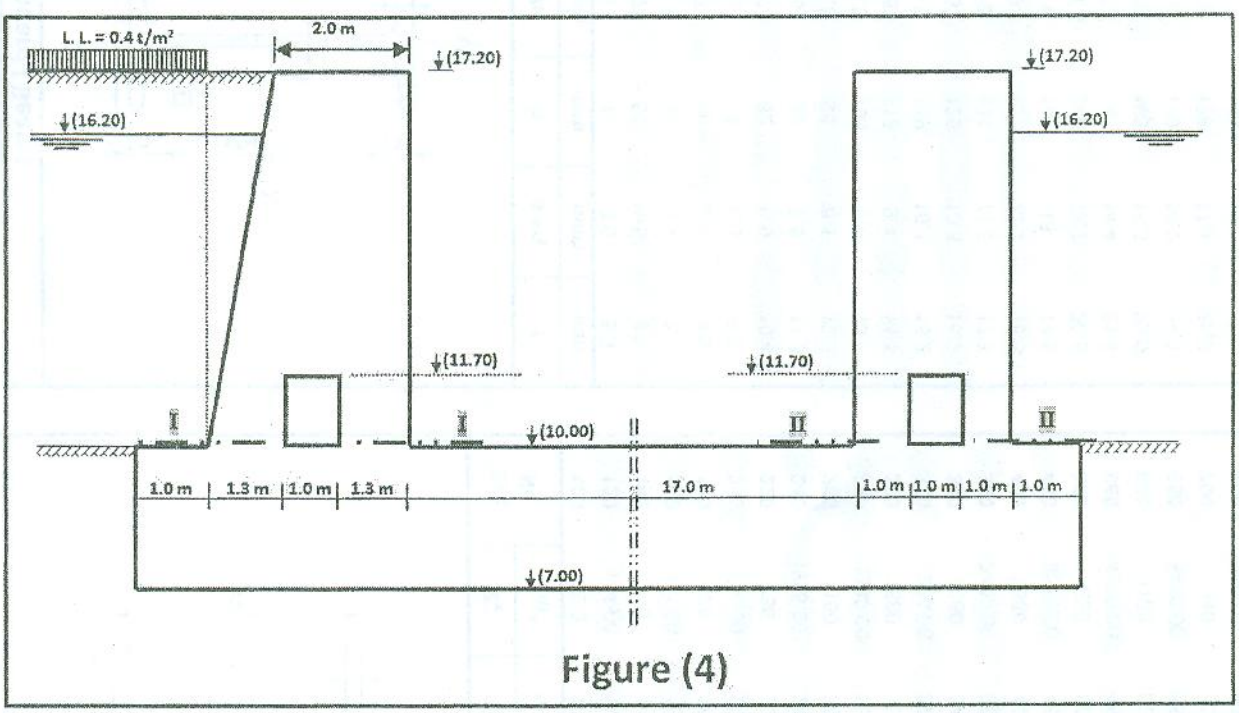


Figure (4)

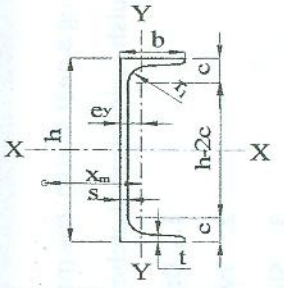
إنتهت الأسئلة

مع أطيب الأمنيات بالتوفيق

د / محمد الشيمى – ولجنة الممتحنين

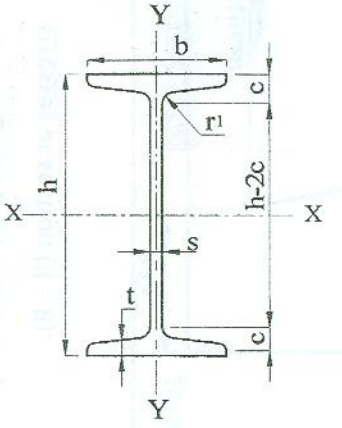
Useful tables: Steel cross section properties

Channels



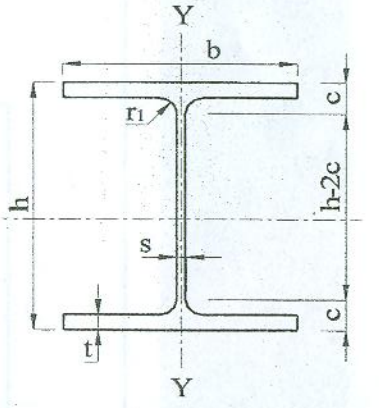
Sec. No.	Z_x	h	b	s	$t=r_1$
	cm^3	mm	mm	mm	mm
30x15	1.69	30	15	4.0	4.5
30	4.26	30	33	5.0	7.0
40x20	3.79	40	20	5.0	5.5
40	7.05	40	35	5.0	7.0
50x25	6.73	50	25	5.0	6.0
50	10.60	50	38	5.0	7.0
60	10.5	60	30	6.0	6.0
65	17.70	65	42	5.5	7.5
70	17.5	70	40	6.0	6.5
80	26.50	80	45	6.0	8.0
100	41.2	100	50	6.0	8.5
120	60.70	120	55	7.0	9.0
140	86.4	140	60	7.0	10.0
160	116.00	160	65	7.5	10.5
180	150	180	70	8.0	11.0
200	191.00	200	75	8.5	11.5
220	245	220	80	9.0	12.5
240	300.00	240	85	9.5	13.0
260	371	260	90	10.0	14.0
280	448.00	280	95	10.0	15.0
300	535	300	100	10.0	16.0
320	679.00	320	100	14.0	17.5
350	734	350	100	14.0	16.0
380	829.00	380	102	13.5	16.0
400	1020	400	110	14.0	18.0

Standard I Beams



Sec. No.	Z_x	h	b	$s=r_1$	t
	cm^3	mm	mm	mm	mm
80	19.5	4.5	42	3.9	5.9
100	34.20	7	50	4.5	6.8
120	54.7	5.5	58	5.1	7.7
140	81.90	7	66	5.7	8.6
160	117	6	74	6.3	9.5
180	161.00	7	82	6.9	10.4
200	214	6	90	7.5	11.3
220	278.00	7.5	98	8.1	12.2
240	354	6.5	106	8.7	13.1
260	442.00	8	113	9.4	14.1
280	542	8.5	119	10.1	15.2
300	653.00	9	125	10.8	16.2
320	782	10	131	11.5	17.3
340	923.00	10.5	137	12.2	18.3
360	1090	11	143	13	19.5
380	1260.00	11.5	149	13.7	20.5
400	1460	12.5	s	14.4	21.6
425	1740.00	13	163	15.3	23.0
450	2040	14	170	16.2	24.3
475	2380.00	15	178	17.1	25.6
500	2750	16	185	18	27
550	3610.00	17.5	200	19.0	30.0
600	4630	16	215	21.6	32.4

Broad Flange I Beams



Sec. No.	Z_x	h	b	s	t
	cm^3	mm	mm	mm	mm
100	89.9	100	100	6.0	10.0
120	144.00	120	120	6.5	11.0
140	216	140	140	7.0	12.0
160	311.00	160	160	8.0	13.0
180	426	180	180	8.5	14.0
200	570.00	200	200	9.0	15.0
220	736	220	220	9.5	16.0
240	938.00	240	240	10.0	17.0
260	1150	260	260	10.0	17.5
280	1380.00	280	280	10.5	18.0
300	1680	300	300	11.0	19.0
320	1930.00	320	300	11.5	20.5
340	2160	340	300	12.0	21.5
360	2400.00	360	300	12.5	22.5
400	2880	400	300	13.5	24.0
450	3550.00	450	300	14.0	26.0
500	4290	500	300	14.5	28.0
550	4970.00	550	300	15.0	29.0
600	5700	600	300	15.5	30.0
650	6480.00	650	300	16.0	31.0
700	7340	700	300	17.0	32.0
800	9890.00	800	300	17.5	33.0
900	10980	900	300	18.5	35.0
1000	12890.00	1000	300	19.0	36.0

TANTA UNIVERSITY

FACULTY OF ENGINEERING

Department of Irrigation and Hydraulics Engineering

Examination 4TH Year Students of Civil Engineering

Course Title: **Design of Irrigation Works (2)**		Course Code: **CIH4107**	
Date: **12- 01- 2012**	Term: **First 2011/2012**	Total Assessment Marks: **85**	Time Allowed: **3 Hours**

Notes:

- *Systematic arrangement of calculations and clear neat drawings are essential.*
- *Any data not given is to be reasonably assumed.*
- الإمتحان مكون من ثلاثة أسئلة فى ثلاث صفحات وورقتين بالإضافة الى جداول قطاعات الحديد.
- غير مسموح باصطحاب أى جداول أو منحنيات.

Question No. 1 (35 Marks)

A. **List** the main dams and barrages which were constructed on the Nile River in Egypt. Then choose **one** of them to **briefly describe**. (5 marks)

B. Using neat sketches, **explain** how you can design an inverted filter downstream a hydraulic structure for a **uniform grain size soil**. (5 marks)

C. Figure (1) shows a longitudinal section of a clear over – fall weir provided with a stilling basin. The canal cross section downstream the weir is shown in Figure (2). **It is required to:**

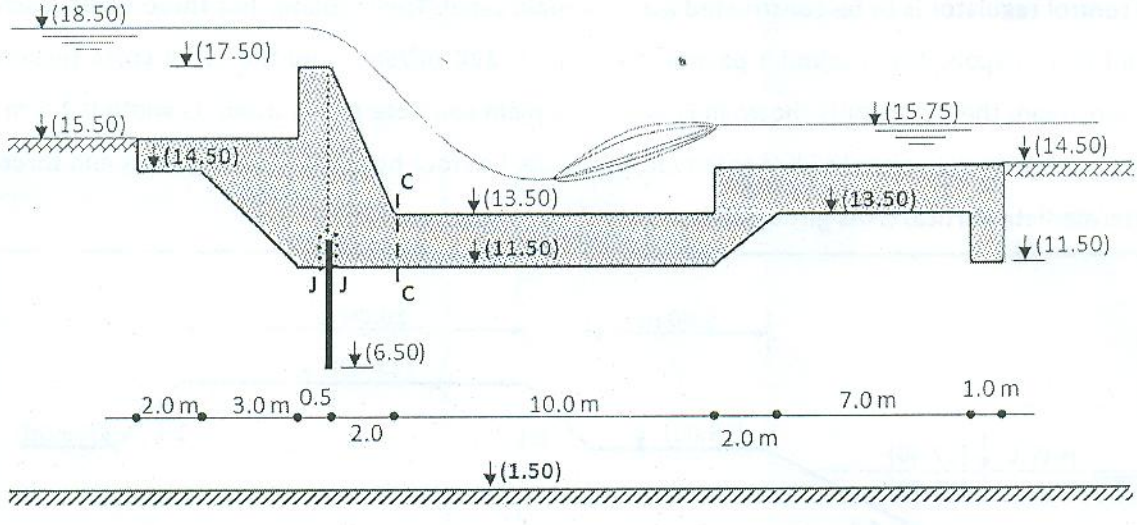


Figure (1)

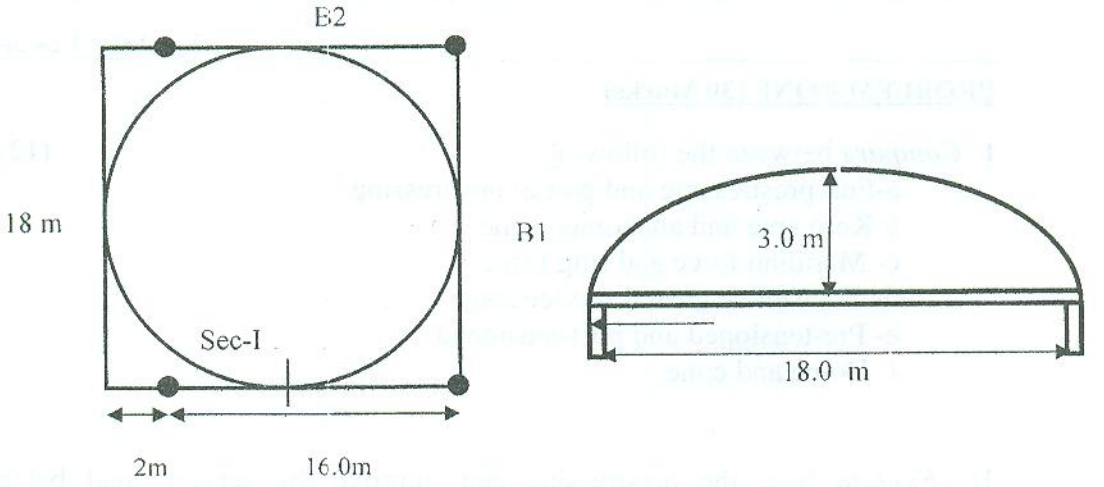
1. Find the **total weir width**, if the maximum passing discharge = 11 m^3/sec. (2 marks)
2. **Check** the percolation length of the weir using Bligh method (C_B = 14). (2 marks)
3. **Using a suitable scale,** draw in your square paper the **flow-net** pattern and then: (5 marks)
   i. **Draw** the uplift pressure diagram. (2 marks)
   ii. **Check** the floor thickness of the weir. (2 marks)

PROBLEM # TWO (30 Marks)

I. Fig. 2 shows key plan for an exhibition hall (18m×18m) with clear height of 6 m. It is required to make a complete design, draw sectional plan, elevation and details of reinforcement for the dome roof structure (3.0m height) which is supported by four prestressed beams.

Note:- (do not add additional columns). **(12 Marks)**

Fig.2



II- Calculate the main external loads of the two beams B1, B2. **(3 Marks)**

III-For the shown pre-tensioned pre-stressed concrete beam B2 (Fig. 2) assuming 12% losses (f_{cu} = 45 MPa). It is required to:-

- Suggest suitable cable profile. **(3 Marks)**
- Calculate the initial prestressing force P_o (P_i) at sec-I. **(3 Marks)**
- Calculate the suitable eccentricity (e) at sec-I. **(3 Marks)**
- Check stresses at transfer and service stages at sec-I. **(3 Marks)**
- Sketch the details of reinforcement. **(3 Marks)**

PROBLEM # THREE (20 Marks)

For the shown area in Fig.(3) of an exhibition hall, columns are allowed on the outer perimeter of the hall (36.0 x 42.0 m) with clear height of 6.0 m. The proposed covering system for the hall is Folded plate roof.

Note:- (one row of columns can be added if it is needed).

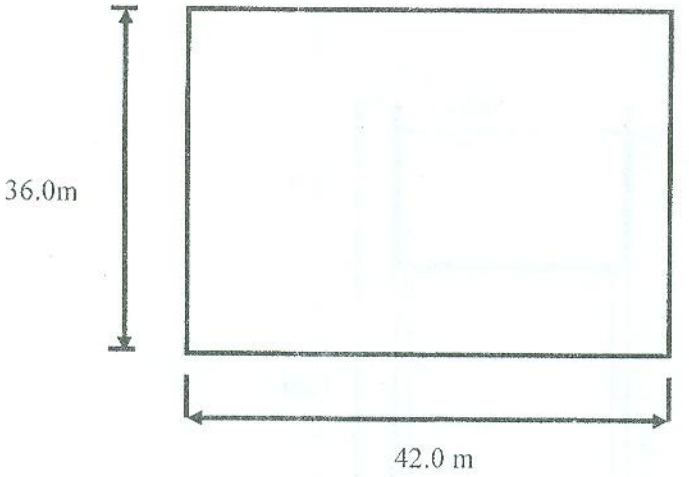


Fig. 3-a

It is required to carry out the followings:

i. ***Calculate*** the internal forces and ***design*** mid span critical section of the folded plates. **(12 Marks)**

ii. ***Draw*** to a convenient scale sectional elevation and plan showing the details of reinforcement of the folded plates. **(8 Marks)**

Fig. 3-b

PROBLEM # FOUR (20 Marks)

For the elevated water tank supported on four columns as shown in **Fig. 4**, it is required to:

i. ***Carry out*** complete design of the tank elements (walls and floor).

(12 Marks)

ii. ***Give*** full reinforcement details for the tank in plan and cross sections.

(8 Marks)

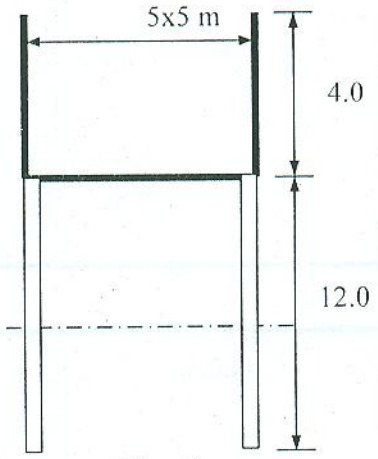


Fig. 4

With best wishes انتهت

الأسئلة

Course Examination Committee:

Prof. Dr. Abd El Hakium Khalil

Assoc. Prof. Dr. Mohamed Hussein **Dr. Nesreen Kassem**

TANTA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF STRUCTURAL ENGINEERING

EXAMINATION (4th YEAR) STUDENTS OF CIVIL ENGINEERING

COURSE TITLE: Reinforced Concrete Design III		COURSE CODE: CSE 4115
DATE: 9-1-2012	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 4 HOURS

Notes:

Systematic arrangement of calculations and neat drawings are essential, any missing data should be reasonably assumed, concrete characteristic strength f_{cu} = 25 MPa, and grade of reinforcing steel is 36/52

الإمتحان مكون من ٤ أسئلة فى ورقتين

PROBLEM # ONE (30 Marks)

I. ***Compare*** between the following :- **(12 Marks)**

a-Full prestressing and partial prestressing.
b-Kern area and anchorage zone.
c- Meridian force and ring force.
d- Transfer stage and service stage.
e- Pre-tensioned and post-tensioned.
f- Dome and cone.

II- ***Explain*** how the prestressing can improve the service load behavior of a prestressed concrete element and give one example.

(4 Marks)

III- ***Discuss*** the basic assumptions of folded plate theory. **(4 Marks)**

IV Shown in Fig. 1 are sectional elevations of four folded plate roof structures. It is required to mark ridge lines with internal edge shear. **(4 Marks)**

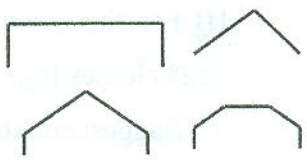
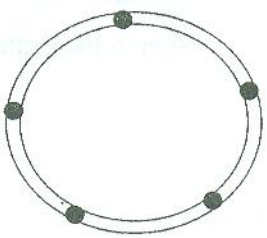


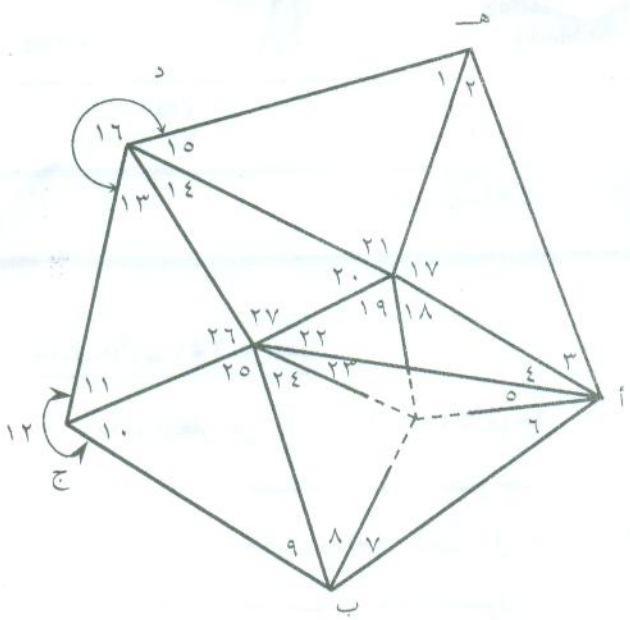
Fig.1

V. ***Classify*** and ***Sketch*** without calculation the details of reinforcement of the shown cylindrical tank (D=5m, H=4m). **(6 Marks)**



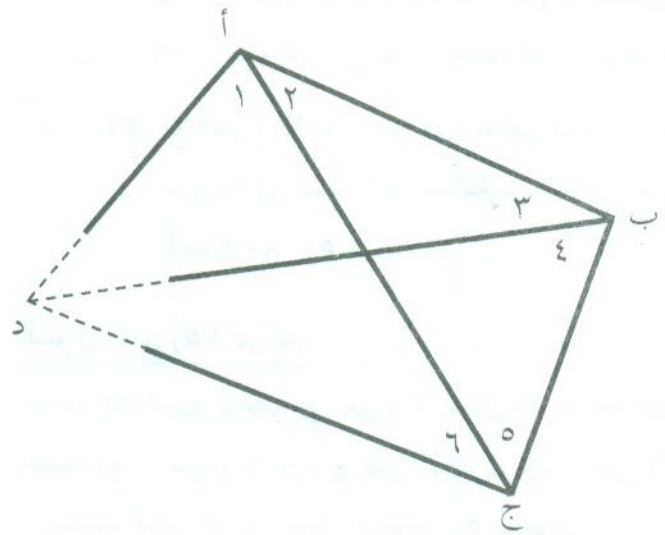
السؤال الثالث (١٠ درجات)

عين عدد ونوع الاشتراطات الهندسية الداخلية لشبكة المثلثات الجيوديسية الموضحة بالشكل مع كتابة معادلة شرطاً واحداً من كل نوع.



السؤال الرابع (٢٠ درجة)

يوضح الشكل جزء من شبكة مثلثات جيوديسية عبارة عن مضلع رباعي (أ ب ج د) مرصود القطرين علماً بأن النقطة (د) غير محتلة والمطلوب ضبط الزوايا المرصودة بالشكل وإيجاد قيمها المصححة بطريقة المعادلات الشرطية إذا علمت أن الزوايا المرصودة كالآتي:



الزاوية ١ = ٣٩° ٤٤′ ٦٨″

الزاوية ٢ = ٤١° ٠١′ ٣٩″

الزاوية ٣ = ٤١° ٥٣′ ٣٠″

الزاوية ٤ = ٣١° ٠٢′ ٦٨″

الزاوية ٥ = ٢٧° ٠٢′ ٤٢″

الزاوية ٦ = ٥٦° ١٥′ ٣١″

مع تمنياتي بالتوفيق

أ.م.د. حافظ عباس عفيفي

Tanta University

Department: Civil Engineering
Total Marks: 70 Marks

...neering

Course Title: Geodesy and Satellite Surveying	Course Code:	Year: 4th
Date: January 26, 2012 (First term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer all the following questions, and assume any missing data)
(answers should be supported by sketches)

السؤال الأول (٢٥ درجة)

أ- تكلم بإيجاز عن كل من الآتي: **(٢٠ درجة)**

١- تطبيقات استخدام نظام تحديد المواقع (GPS) في الهندسة المدنية

٢- مكونات قطاع الفضاء في نظام (GPS)

٣- ما يجب مراعاته للحصول على دقة عالية عند الرصد بنظام تحديد المواقع (GPS)لتعيين احداثيات نقطة

٤- حيود القمر الصناعي في مساره عند المدار المحدد له

٥- كيفية المفاضلة عند شراء اجهزة استقبال نظام (GPS)

٦- العوامل التي يتوقف عليها اختيار طريقة معينة للرصد بنظام (GPS)

ب - أذكر مع الشرح الأخطاء التي تتعرض لها الموجات الصادرة من الأقمار الصناعية لنظام GPS نتيجة مرورها في الطبقات المختلفة من الغلاف الجوي ثم بين كيف يمكن التغلب على هذه الأخطاء أثناء الرصد. **(٥ درجات)**

السؤال الثاني (١٥ درجة)

أ- إذا كان لديك نوعان من أجهزة الاستقبال الأول بدقة محتملة (٧,٠ سم + ١,٥ جزء في المليون) والثاني بدقة محتملة (٠,٤ سم + ٦ جزء في المليون) واريد قياس خطي قاعدة بطول ٢٥ كم ، ٦٠ كم _ حدد أنسب جهاز تستخدمه لقياس كل من خطي القاعدة. **(٥ درجات)**

ب- أوجد الإحداثيات الكارتيزية للنقطة (م) على نظام إحداثيات ECEF system إذا علمت أن الألبسويد المرجعي هو WGS 84 وأن الإحداثيات الجغرافية لها هي:

زاوية خط العرض (ϕ) = ٣٥° ١٢'

زاوية خط الطول (λ) = ٣٢° ٤٥'

الأرتفاع الألبسويدي (h) = ٤٦٢,٠٨ متر

نصف قطر المحور الأكبر = ٦٣٧٨,١٣٧ كيلو متر ، نسبة الأنبعاج = ١/ ٢٩٨,٢٥٧ **(١٠ درجات)**

Problem number (3) **(14 Marks)**

(a) Derive expression to calculate the discharge of deep well sunk through a layer of sand deep into an impermeable layer of clay. **(3.0 Marks)**

(b) Using clear sketch, explain the reasons which lead to cracks and sometimes failure in old buildings due to the dewatering of adjacent sites. **(3.0 Marks)**

(c) Discuss in details how to design and to construct a method to insure the safety of an old building adjacent to a proposed project if the excavation bed is much deeper than the foundation level of the old building considering that it is too dangerous to use any dewatering process. **(3.0 Marks)**

(d) Show the procedures to check the possibility of constructing additional floors on an old building if the owner lost all the drawings of building. **(3.0 Marks)**

(e) Discuss in details the main precautions should be considered when constructing machine foundation. **(2.0 Marks)**

Problem number (4) **(13 Marks)**

(a) The section of trench excavation is 3.00 wide and 5.50 depth and 100.0 m long. The soil profile consists of 7.0 m medium clay underlain by 8.0 m fine to medium sand on very stiff to hard clay and the initial ground water table is (-1.0 m). The coefficient of permeability for sand layer = 0.00055 m/sec. One row of **6 deep wells** fully penetrate the sand layer was placed at 1.0 m apart of the trench as shown in figure 3. The submersible pump capacity is 60.0 m^3/hour. The constant C =2500.

(i) Check the drawdown below the excavation at point A **(5.0 Marks)**

(ii) Discuss without calculation how to modify the dewatering system if the estimated drawdown is greater or less than the required drawdown by more than 50 cm. **(2.0 Marks)**

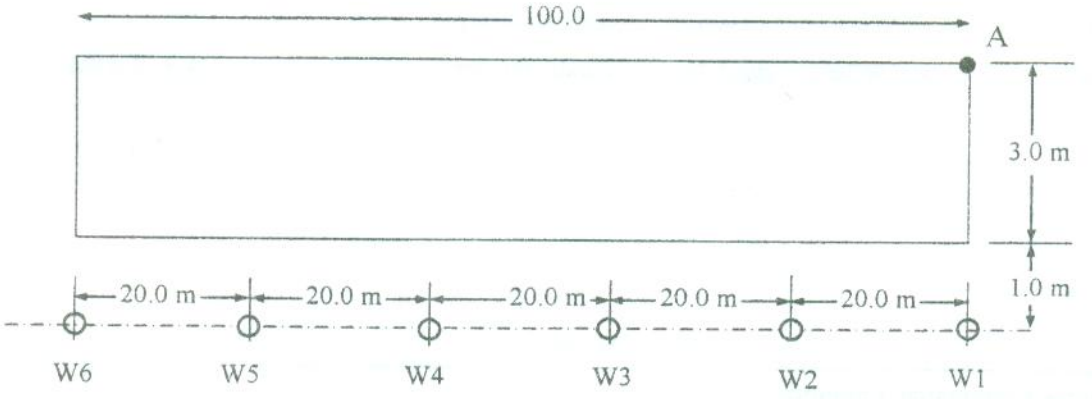


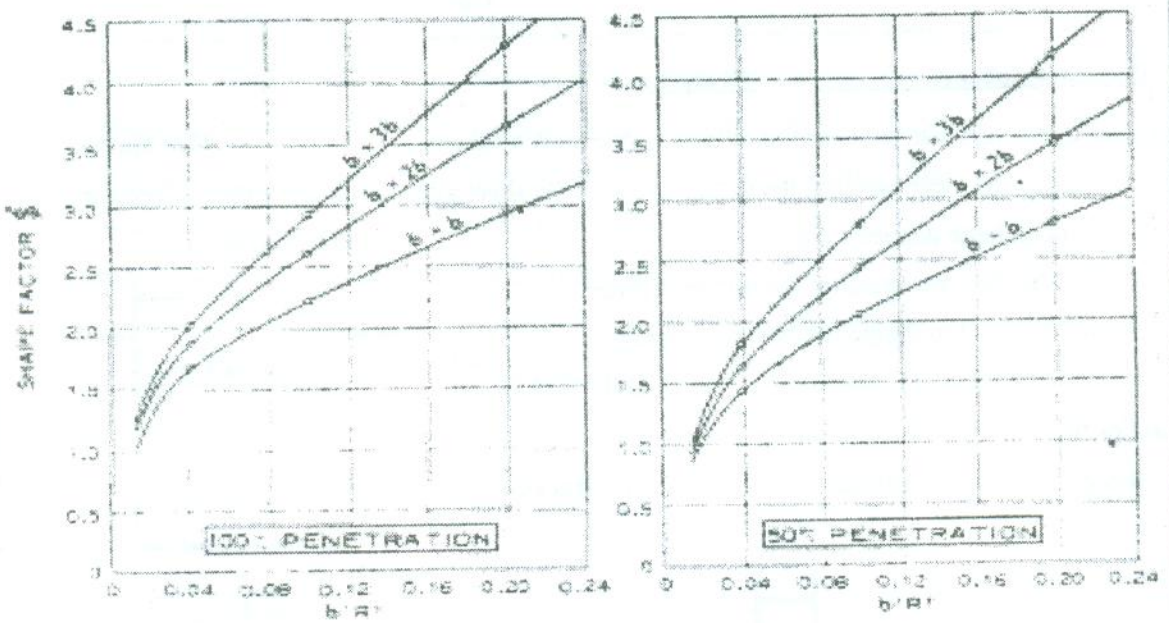
Figure 3

Equations

$$H - h = \frac{1}{2\pi K D} * \sum Q_i \ln (R/r_i)$$

$$H^2 - h^2 = \frac{1}{\pi K} * \sum Q_i \ln (R/r_i)$$

$$Q = K D (H - h_e) \$$$



(b) The basement of building requires 20 x 40 m excavating 4.00 m deep in a bed of clay which overlies a 6.0 m bed of sand with an impervious layer below. The depth of clay layer and its saturated unit weight are 8.0 m and 8.0 kn/m^3 respectively. The initial ground water table is (-0.50 m) and the coefficient of permeability for sand layer = 0.00048 m/sec. Fully penetrating wellpoints were placed around the site 1.0 m apart from the excavation. The yield discharge of the well is 0.0004 m^3/sec. Considering C = 1000 and, you are required to:

(i) Design the pressure relief system **(4.0 Marks)**

(ii) Check if the excavation needs pressure relief system if the initial ground water table is (-2.0 m) **(2.0 Marks)**

Problem number (5) (12.0 Marks)

A client is interested to construct a residential building without basement. The site is 20 x 30 m with the long side in x-x direction. He was hesitated regarding the number of typical floors to be constructed. The design engineer was given the following data:

- The thickness of plane concrete = 0.30 m
- The thickness of reinforced concrete = 1.00 m
- The unit weight of soil = 1700 kg/m^3
- The foundation level = 3.0 m
- The load of one floor = 580 t acting in the left bottom quarter with e_x=0.15 m and e_y =0.25 m
- The acting moment on the raft due to considering the lateral loads in y-y direction = 500 tm.
- The live load of the ground floor = 500 kg/m^2 and the unit weight of sand fill = 1600 kg/m^3
- The allowable net pressure =1.25 kg/cm^2. Using detailed calculations of stresses under the raft:

(i) Determine the number of floors the soil can sustain safely for the case of vertical loads only **(4.0 Marks)**

(ii) Determine the number of floors the soil can sustain safely for the case of both vertical and lateral loads. **(4.0 Marks)**

(iii) If the client decide to construct basement, ground and 10 typical floors at the same foundation level, check the stress under the raft **(4.0 Marks)**

Course Examination Committee

أ.د.م : مصطفى عبد اللطيف الصواف

أ.د.م : أشرف كمال نظير

Tanta University

Structural Engineering Department
Total Marks: 75 Marks

Faculty of Engineering

Course Title: Foundations Engineering (2)	Course Code: CSE4116	Year: 4th
Date: January 23rd 2012 (First term)	Allowed time: 3 hrs (Term Exam)	No. of Pages: (4)

Answer the following questions … answers should be supported by clear sketches

Problem number (1) **(18 Marks)**

(a) Discuss in details the main information required to design the sheet piling retaining walls **(4.0 Marks)**

(b) For the anchored sheet pile wall shown in figure (1) calculate the followings:-

1) The minimum depth of embedment, d, to provide stability. **(7.0 Marks)**

2) The required section modulus of the steel sheet pile and waling **(7.0 Marks)**

Data :

The allowable stress of steel is 2000 kg/cm2

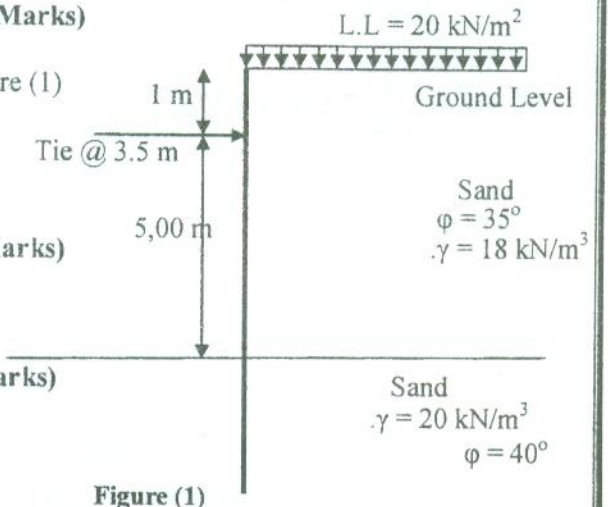


Figure (1)

Problem number (2) **(18 Marks)**

(a) Discuss using clear sketches the different types of braced cut. **(3.0 Marks)**

(b) Discuss using clear sketches the details of using the sheet piles to support a bent of pressurized embedded large diameter pipe. **(3.0 Marks)**

(c) Discuss using clear sketches the different forces which are used to design the block anchorage system for anchored sheet pile. **(3.0 Marks)**

(d) For the braced excavation shown in figure (2) design the whole structural **(9.0 Marks)**

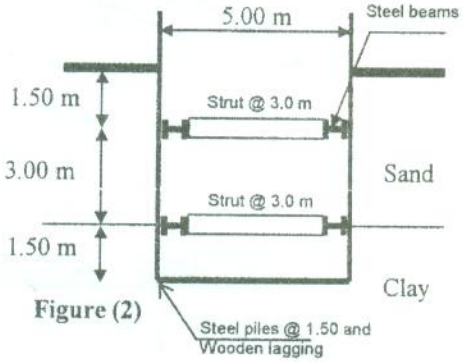


Figure (2)

Section of steel sheet pile

For sandy layer
Unit weight = 17.00 kN/m3
angle of internal friction, ø = 30°
For clayey layer
Unit weight = 20.0 kN/m3
Colesion, C = 60 kN/m2
Live load at surface = 15 kN/m2

P.T.O.

b) Determine the volume of compacted materials in cubic meter per hour if the width of the roller 2.25 m. thickness of compacted layer 15 cm. velocity of roller 15 km/hr and efficiency considering weather and other factors is 0.6.

Question No. 5

a- Draw a neat sketch of a cross section of the flexible pavement design element showing in detail its layer contents.

b- A two lane of 3.75 m. traffic lane width goes around a 8 degree curve, for a design speed of 100 km/hr it is required to:

- Compute the extra width required at the curve.
- Compute the minimum length of transition curve.
- Draw a plan showing the development of widening.

مع تمنياتي بالتوفيق

أ.د. محمد حافظ فهمي علي

Tanta University

Department: Civil Engineering
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Highway Engineering | Course Code: | Year: 4th
Date: January 26, 2012 (First term) | Allowed time: 3 hrs | No. of Pages: (2)

Remarks: (answer all the following questions, and assume any missing data)
(It is allowed to use Highway Data Sheet. Answers should be supported by sketches)

Question No. 1

a- Why Compaction is made for Highway Sub-grade?

b- Explain the various types of Rollers used for compaction and their efficiency in compacting various types of soils.

Question No. 2

Compare between the GI- and C.B.R design method to determine the thickness of a flexible pavement layers on a sub-grade, which has the following data:

a wheel load of 12000 Ib, the sub-grade soil has a C.B.R. value of 3% and the sub-base having a C.B.R. value of 16%. GI of the Sub-grade=16.4, and the ADT=2000 veh./day, and the percent of heavy traffic is 10%.

Question No. 3

30-in. plate loading test performed on sub-grade soil, and on a 12 inches base coarse yielded the results shown below:

Deflection (in)	0.01	0.03	0.05	0.06	0.08	0.10
Load in Ib (sub-grade)	3532	8100	11330	12010	13423	14130
Load in Ib (12" base)	5652	12717	17662	20135	24757	28260

Determine the modulus of sub-grade reaction of the soil and the soil-base course combination.

Question No. 4

a- Draw a neat sketch showing the method to compact the sub-grade of a highway in straight line and in curve.

b- A clayey soil of max. dry density 130Ib/ft^3 in the laboratory was compacted in the field by means of rollers. A cylindrical specimen measuring 4 inches diameter and 5 inches height was taken after each pass. The following data was obtained:

No. of passes	1	2	3	4	5
Weight of specimen (Ib.)	4.4	4.5	4.75	4.94	5.3
w/c %	12	13	12	10	11

a) Determine the number of passes required for the proposed compaction 95%.

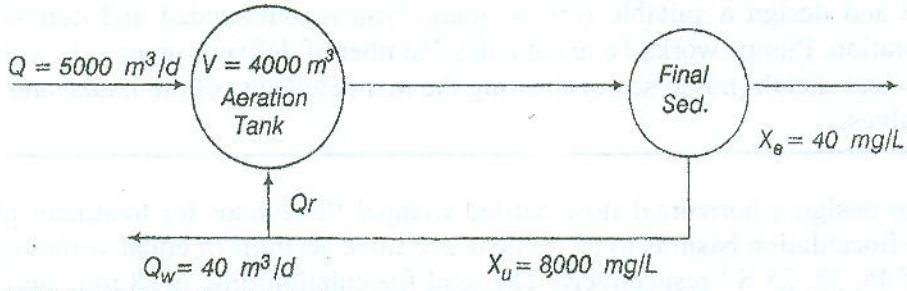
4-c) It is required to determine the number, dimension and the net water production of clari-flocculator for city water treatment plant, given the following data:

- pop.	240,000 capita	- $T_{floc.}$	0.5 hr.
- W_C	280 lit./capita/day	- T_{sed}	2.5 hr.
- SLR	$\leq 30\ m^3/m^2/day$	- Working period	20 hr/d
- SS in raw influent	120 mg/l	- Water content in sludge	90%
- Eff. Of sedi. Tank	85%		

5-a) - State the purposes of ground storage tank.
- Discuss briefly with sketches the method of operation of elevated tank. And draw the sectional elevation of the tank showing all pipe and valves.

5-b) For a city of population 250,000 capita and average water consumption 180 l/c/d. It's required to design the ground reservoirs and draw sketch for one of the reservoirs showing all pipes and valves.

5-c) Determine the effluent BOD and the recirculation flow to be expected from an aeration tank treating sewage with a BOD_5 of 250 mg/l, assume Y=0.55, K_d=0.05, Θ_c=27 days.



6-a) - Draw a flow diagram for the primary treatment units briefly discussing the functions of each unit.
- Find the recirculation ratio in the activated sludge process.

6-b) The settling velocity in grit chamber designed to remove particles with a diameter of 0.2 mm was found to be 0.022 m/s. A flow through velocity of 0.3 m/s will be maintained by a proportional weir. Determine the channel dimensions for maximum wastewater flow of 12,000 m^3/d.
It is also required to design primary sedimentation tank to remove approximately 65%, 35% of suspended solids and BOD respectively, with retention period of 2.5 hrs.

6-c) A conventional Activated sludge system is to be used for secondary treatment of 13,000 m^3/d of municipal wastewater. After primary treatment the BOD_5 is 210 mg/l and it is desired to have not more than 5 mg/l of soluble BOD_5 in the effluent. A completely mixed reactor is to be used, and pilot plant analysis has established the following kinetic values Y= 0.5 kg/kg, K_d=0.05 d^{-1}. Assume a MLSS concentration of 3000 mg/l and an underflow concentration of 10,000 mg/l from secondary clarifier and Θ_c=10 day. Its required to determine:- Volume of the reactor – Volume of solids to be wasted daily – Mass of solids wasted – Sludge recycle ratio. – Area of secondary clarifiers required (SLR = 24m/d).

Hints :

$V = 0.355\ C\ D^{.63}\ S^{0.54}$ $\quad HP = \gamma\ Q\ H_t / 75\ \eta_1\eta_2$ $\quad \eta_1\eta_2 = 0.8$ $\quad P = G^2\mu V$

$\mu = 1.02 \times 10^{-3}$ N.s/m² $\quad \rho_w = 999.1$ kg/m³ $\quad C_D = 1.8$ $\quad P = C_d\ \rho_w\ A_p\ V_p^3/2$

$$V = \frac{QY\theta_c\,(S - S_o)}{X\,(1 + K_d\theta_c)}$$

$$n = \left\{ \left(\frac{2\,\mu\,T}{\rho(1.44 + f)} \right) \left(\frac{H\ L\ G}{Q} \right)^2 \right\}^{\frac{1}{3}}$$

Good luck
Dr. A. El-Morsy
Dr. Abdelaziz El-sayed

Tanta University
Faculty of Eng.
Public Works Eng. Dept.

Sanitary Engineering
Jan. 2012

4th Year
Civil Eng.
Time: 3 hrs

1-a) - Discuss the conditions that should be considered when choosing the type and location of an intake for a city water supply system.
- Draw a flow diagram in surface water purification plant and point the purpose of each step of treatment.

1-b) A city has population of 140,000 and 116,000 for the years 2010 and 2000 respectively. The water source to the city is a wide canal with width about 200 m , H.W.L. at (9.50), L.W.L. at (8.00), Bed level at (3.00), G.L. at (10.50), Road level at (11.50), The canal about 5500 meters away from the city, and water level in the rapid mixing tank at (22.00). The water treatment plant collection works for the city is designed to serve the year 2060 considering geometrical growth rate of increase and water consumption of 200 L/cap./day. It is required to :

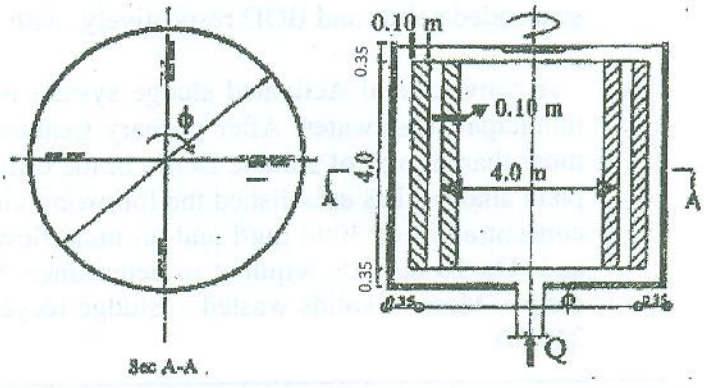
a- Estimat the future population and average, max. monthly, max. daily, amd max. hourly discharge values at year 2060.
b- Choose and design a suitable type of intake you recommended and delivery pipes taking into consideration, Pumps works 16 hrs at a day Number of delivery pipes = 1, with velocity 1.67 m/s.
c - Draw a neat sketch (not to scale) showing the main elements of the intake and pumps arrangement and valves.

2-a) Its required to design a horizontal flow baffled channel flocculator for treatment plant of 22,000 m^3/d capacity. The flocculation basin is to be divided into three sections of equal volume, each section having constant G of 45, 35, 25 S^{-1} respectively. The total flocculation time is 28 min. and the baffles material have a roughness coefficient of 0.29. A common wall is shared between the flocculation and sedimentation basins, the length of flocculator is fixed at 15 m with a depth of 1.5 m is considered.

2-b) For the discharge in (a) and with typical Alum dose of 35 mg/lit, its required to determine :-
- The dimension and power requirements for rapid mixing tank if T = 60 sec, G = 700 sec^{-1}
- The required amount of Alum ton/day.
- The required capacity and number of the Alum solution tanks sufficient for one day.

3-a) Name the various chemical coagulants which are commonly used in coagulation process.

3-b) A flocculator basin illustrated in figure is rotated through water with velocity of outer paddles, V_p= 0.5 m/s. How much power is dissipated into water, if the flow is 8,600 m^3/d. Determine the G value , if the retention time is 30 min.



4-a) - Discuss the different between Plain and coagulant sedimentation.
- Describe the four zones of a long rectangular sedimentation tank.
- Give short notes for the different type of filters according to the following items :- direction of flow, filtration rate, filter media.

4-b) A rapid sand filter unit 7 × 8 m. After filtering 11,000 m^3/d in 24 hr period, the filter is backwashed at a rate of 750 $m^3/m^2/d$ for 12 min. Calculate the average rate of filtration, the quantity and percentage of treated water used in washing.