جامعة طنطا – كلية الهندسة | إمتحان الفصل الدراسي الأول

الفرقة : الرابعة – هندسة مدنية | ٢٠٠٨/٢٠٠٩

المـــادة : الجيوديسيا والمساحة بالأقمار الصناعية | الزمن : ثلاث ساعات

اجب على الأسئلة الآتية:

السؤال الأول

أ- أذكر عناصر شبكة المثلثات الجيوديسية ثم تكلم عن نظام شبكات المثلثـــات الجيوديـــسية الموجودة في جمهورية مصر العربية.

ب- أشرح مع **التوضيح بالرسم الدقيق** طرق قياس المسافة بين القمر الصناعي والنقطة المحتلـــة بالمستقبل الأرضي لنظام الرصد العالمي GPS.

ت- أذكر مع **الشرح مستعيناً بالرسومات الدقيقة** أساليب الرصد المستخدمة في نظام تحديـــد المواقع بالرصد على الأقمار الصناعية (GPS) ثم رتب أساليب الرصد تبعاً لدقتها مع ذكر اسباب هذا الترتيب.

السؤال الثاني

إذا علمت أن الاحداثيات الكرتيزية (X,Y,Z) للنقطة (س) بالأمتار كما يلي:

الاحداثي (X) = ٤٥٩٢٣٨٥,٦ متر

الاحداثي (Y) = ٣٠٢٤٧١٢,٨ متر

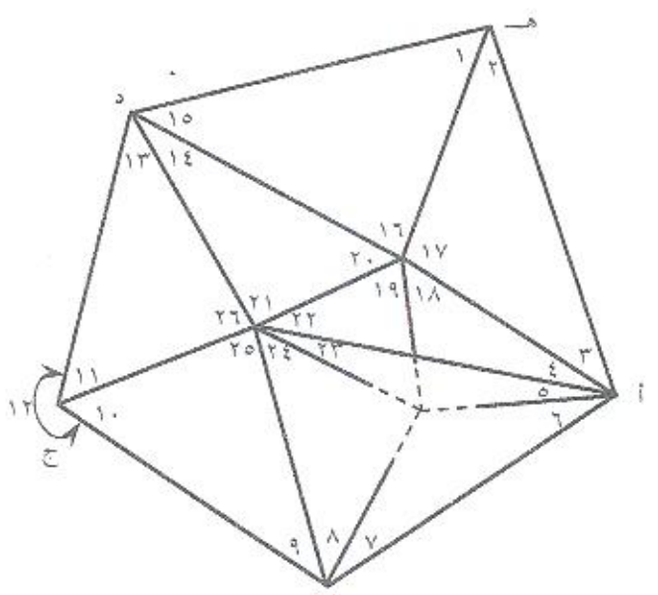
الاحداثي (Z) = ٣٢٤٨١٢٨,٤ متر

أوجد الاحداثيات الجغرافية لها علماً بأن الألبسويد المرجعي هو WGS 84.

نصف قطر المحور الأكبر = ٦٣٧٨,١٣٧ كيلو متر ، نسبة الأنبعاج = ١/ ٢٩٨,٢٥٧

السؤال الثالث

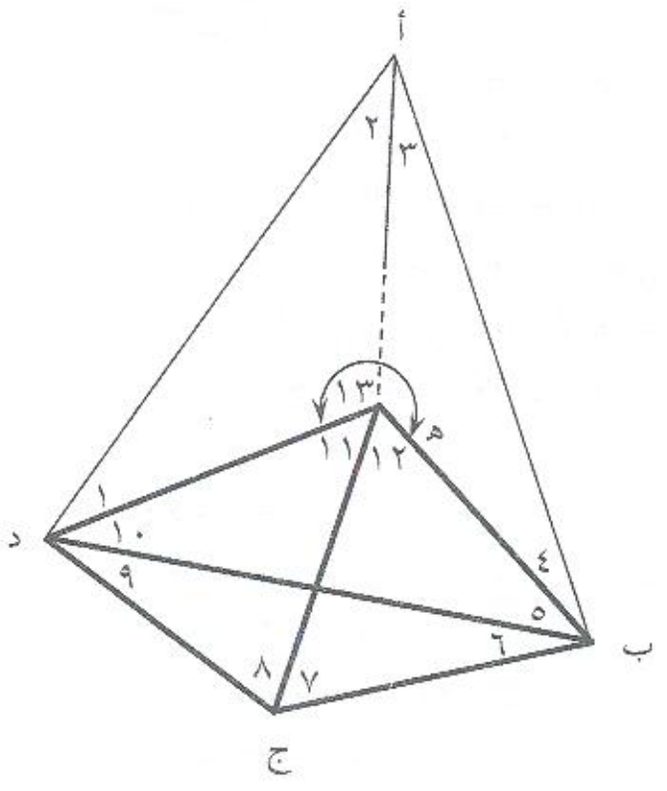
عين عدد ونوع الاشـــتراطات الهندســـية الداخلية لشبكة المثلثات الجيوديسية الموضحة بالشكل مع كتابة معادلة شرطاً واحداً مـــن كل نوع.



تابع السؤال الرابع خلف الورقة

السؤال الرابع

يوضح الشكل جزء من شبـــكة مثلثات أ ب هـــ د الذي رصدت فيه الزوايا ١ ، ٢ ، ٣ ، ٤ ، ١٣ حديثاً كأمتداد لجزء الشبكة ب ج د هـــ المصححة مسبقاً والمطلوب ضبط الزوايا المرصودة حـــديثاً بالشكل وإيجاد قيمها المصححة بطريقة المعادلات الشرطية إذا علمت أن الزوايا كالآتي:



الزاوية ١ = ٢٠° ٢٠′ ٥١″

الزاوية ٢ = ٢٤° ٣٣′ ٢٦″

الزاوية ٣ = ٠٠° ٠٨′ ٣٥″

الزاوية ٤ = ٢٤° ٥١′ ٤٨″

الزاوية ٥ = ٤١° ٤٤′ ٠٧″

الزاوية ٦ = ٠٢° ٣٠′ ٣٠″

الزاوية ٧ = ٢٠° ٣٢′ ٧٤″

الزاوية ٨ = ٣٥° ٣٩′ ٣٨″

الزاوية ٩ = ٠٣° ١٨′ ٢٨″

الزاوية ١٠ = ٣٢° ٢١′ ١٠″

الزاوية ١١ = ٤٩° ٤٠′ ١٠٢″

الزاوية ١٢ = ٥٧° ١٢′ ٥٩″

الزاوية ١٣ = ١٤° ٠٦′ ١٩٨″

مع تمنياتي بالتوفيق

أ.م.د/ حـــافظ عباس عفيـــفي

Tanta University
Faculty of Engineering
Structural Engineering Department

Foundations Engineering (2); CSE4140
4th year, Jan. 2009
Allowable time: 3 hours
(هندسة مدنيه – لائحة جديدة)

Answer all the following questions.

Question No. (1)

a) What is the importance of site exploration?

b) What are the different techniques of subsurface investigation?

c) Describe a method to determine in site bearing capacity of sandy soils.

d) Discuss with clear sketches the penetration testing of the soil in the field, what are the applications of such tests in engineering practice.

e) Some precautions have to be taken in site exploration in the case of problematic soils..... Discuss with clear sketches.

f) How to find the free swell experimentally in the laboratory.

g) Mention a simple method in the field to confirm the presence of collapsing soils.

Question (2)

(a) Explain with clear sketches the different types of anchorage systems.

(b) Discuss in details the main information required to design a sheet piling retaining walls.

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

1) The minimum depth of embedment, d, to provide stability.
2) The required section modulus of the steel sheet pile.

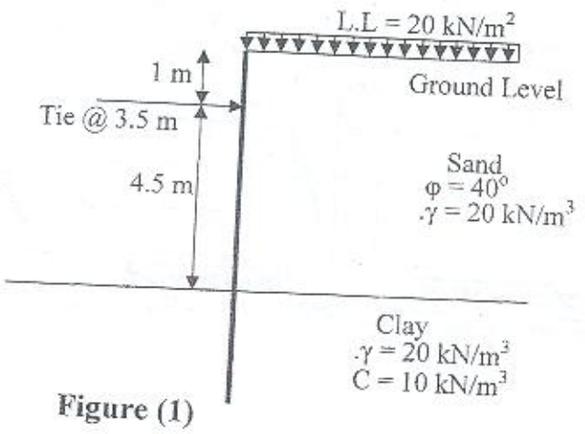


Figure (1)

Data :

The allowable stress of steel is 2000 kg/cm²

Question (3)

(a) Using clear sketches, illustrate the different types of caissons.

(b) Using clear sketches show the details of the cutting edges of the caissons.

(c) A circular caisson with inner diameter of 11.0 m and reinforced concrete wall of 1.0 m thick was constructed. It is required to sink the caisson to a depth of 14.0 m to rest on gravelly soil ($\gamma = 20$ kN/m^3, $\varphi = 40°$). Assuming that the ground water level is located at the ground level.

Calculate the followings:-

1) The thickness of the concrete seal to prevent the water interring the caisson.
2) Check the stability of the caisson against the uplift.

Question (4)

(a) Using clear sketch define the artesian flow and prove a formula to determine its discharge.

(b) Using clear sketch illustrate the difference between the sectional and plan flow nets.

(c) Discuss in details how to design a machine foundation illustrating the main points which should be considered in the design.

(d) Using clear sketch suggest a method of dewatering for a site consist of medium sand if the required water drop = 8.0 m

(e) Using clear sketch, describe how to check the stability of an excavation bottom against piping and heave illustrating what to do if the excavation bottom is unsafe.

(f) Using clear sketch explain how an engineer guarantee the safety of an adjacent old building if:

(i) The proposed foundation level is much lower than that of the existing building

(ii) The proposed foundation construction necessitates drop of water level by dewatering process

Question (5)

The section of an excavation is rectangular (20 x 60) m in plan and 7.0 m in depth. The site profile consists of 8.0 m medium to stiff silty clay overlying 3.0 m fine to medium sand on intact granite bedrock. The initial ground water table is (-2.0 m). The nearest waterway is parallel to the long side of the excavation and is far 250 m. The coefficient of permeability for sand layer = 0.01 m/sec and the radius of influence of wells R = 100 m. The available wells are 50 cm in diameter and 9.5 m in length with discharge capacity = 0.007 m^3/sec.

(i) Design the pressure relief system ,

(ii) Estimate the draw down of water at wells and at the center of site.

(iii) Determine the water height at midpoint between wells

Question (6)

A recently graduate engineer was asked to design and check the stresses under raft foundation of eleven floors residential building to resist the **lateral loads due earthquakes and wind loads** and he was given the following data:

- The thickness of plane concrete = 0.40 m
- The thickness of reinforced concrete = 1.20 m
- The unit weight of soil = 1700 kg/m^3
- The raft dimension is 20 x 20 m
- The total load of the structure = 4500.0 t acting in the right top quarter with e_x=0.2 m and e_y=0.25 m
- The maximum lateral load due to earthquake in (x) direction = 90.0 t and the acting moment on the raft due to it = 1000.0 tm.
- As the owner of the proposed project was hesitated to construct a basement floor or not, the geotechnical consultant report suggested the following recommendations:

  The allowable net pressure =1.25 kg/cm^2 at foundation level = 2.0 m

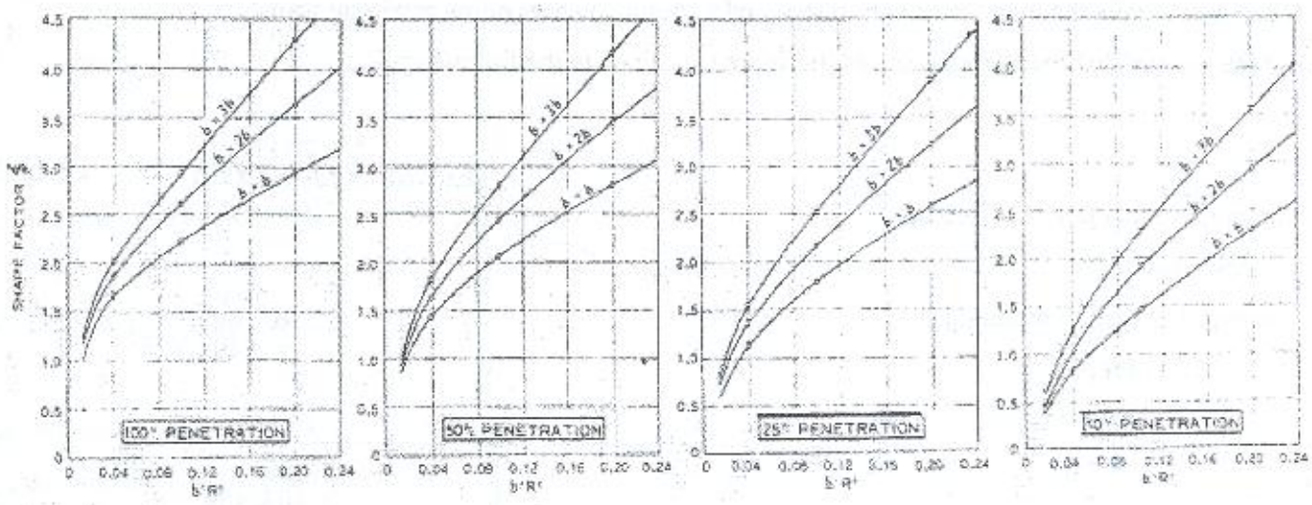
  The allowable net pressure =1.50 kg/cm^2 at foundation level = 4.0 m

- If the owner let the decision of constructing basement floor or not to the engineer who was confused;

(a) Using detailed calculations of stresses under the raft for the case of vertical loads only and the case of both vertical and lateral loads, show the owner that he has to construct the basement floor

(b) If the owner chose the foundation to be raft over piles to avoid basement construction and the engineer told him that the number of 0.5 m in diameter piles required was 100 piles to be constructed in 10 rows and ten columns at 2.0 m spacing, determine the maximum and the minimum loads in the piles for the case of both vertical and lateral loads.

(c) If the engineer was worried about the ability of the piles to resist the 90 ten lateral load, advice him how to do the check and if not safe show the engineer how to design them if the pile length and diameter are known and the soil profile is clay.



Problem Four (25%)

a. For the shown flat slab in Fig. 1 (**Problem one**) supported on two columns, it is required to conduct complete design for the slab showing details of reinforcements.

Data

- Slab thickness = 220 mm,
- Covering material = 2 kN/m^2,
- Live load = 2kN/m^2.

b. For the shown cross sectional elevation of reinforced concrete dome in Fig.6, it is required to carry out the following:

- ***Calculate*** the acting loads on the supporting beams for the given top load plus its own weight.
- ***Sketch*** reinforcement details of the dome in both plan and sectional elevation.

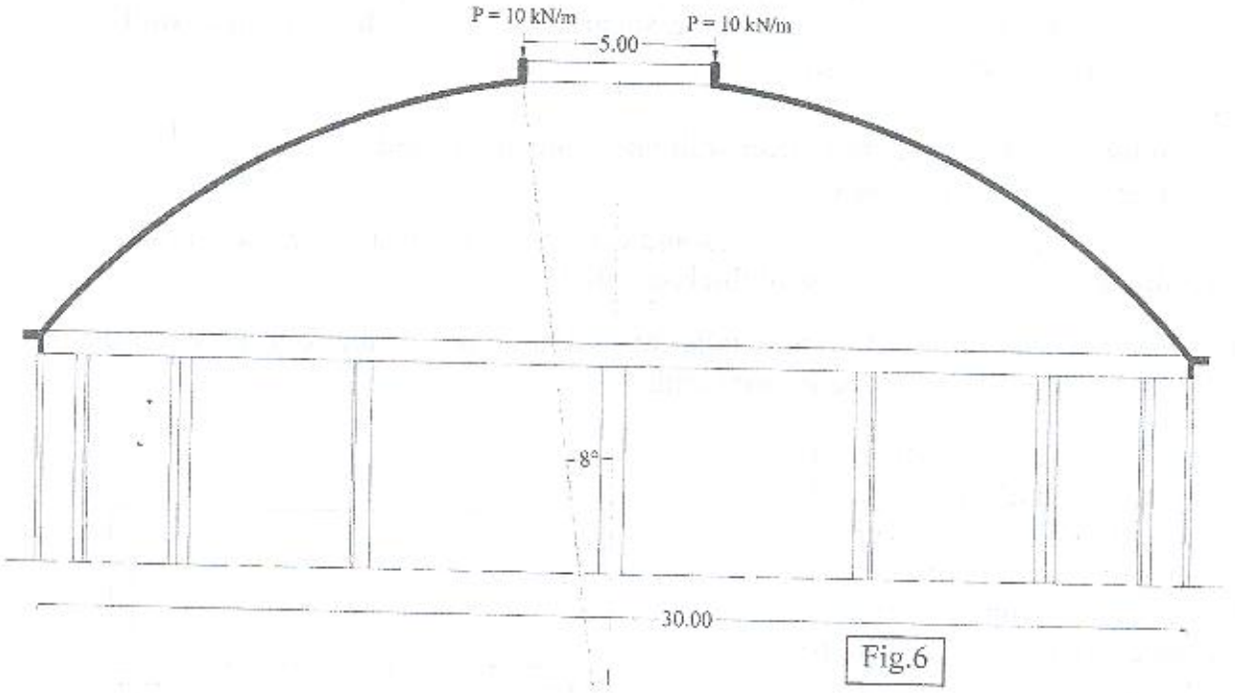


Fig.6

مع اطيب الامنيات بالتوفيق

أ.د. صلاح الدين فهمى طاهر
د. حمدى محى الدين عفيفى

d. For the three deformed modes of tall buildings under the effect of lateral loads shown in Fig.4, it is required to match the following three options with the three modes.

1- Dominant mode for cantilever shear wall
2- Dominant mode for framed structures
3- Dominant mode for coupled shear wall

Explain your selection for each case.

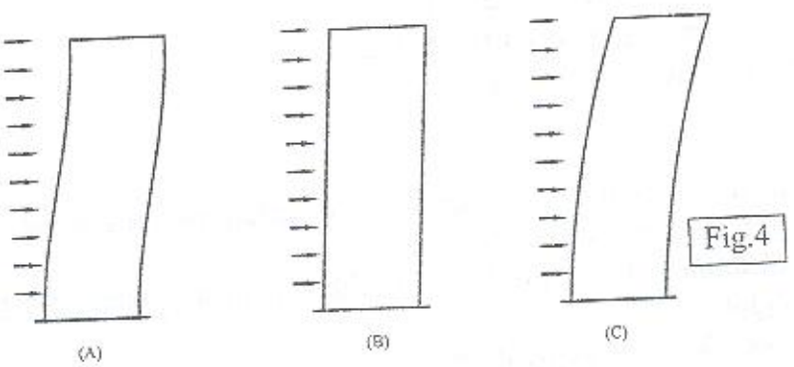


Fig.4

Problem Three (30%)

a. Given a reinforced concrete cantilever shear wall of total height of 22 m supporting an ultimate vertical load of 25000 kN and an ultimate horizontal top load of 2000 kN. It is required to carry out the following considering square box section for the shear wall of outer side of 5 m and inner side of 4 m:-

- Draw N.F.D, S.F.D and B.M.D.
- Design the reinforced concrete shear wall under the given loads.
- Calculate the top drift of the wall.

b. It is required to allocate the center of mass and center of rigidity for the shown plan in Fig. 2A (**Problem One**). Assume the wall thickness 400 mm.

c. It is required to discuss the different details for various types of the joint between the wall and floor in case of elevated rectangular tank.

d. For the shown cross section of elevated open conduit in Fig. 5 supported on columns spaced every 5 m in the longitudinal direction, it is required to conduct complete ultimate design for the conduit showing details of reinforcement.

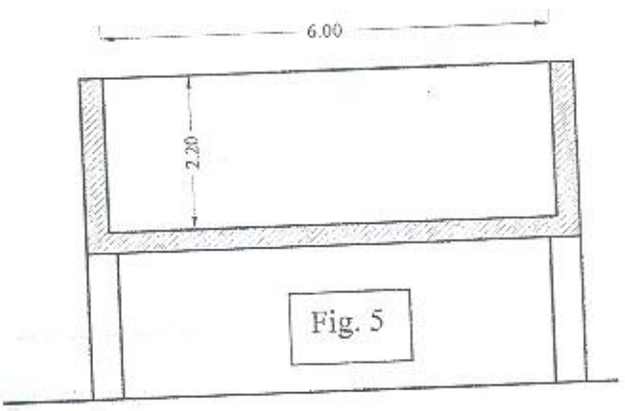


Fig. 5

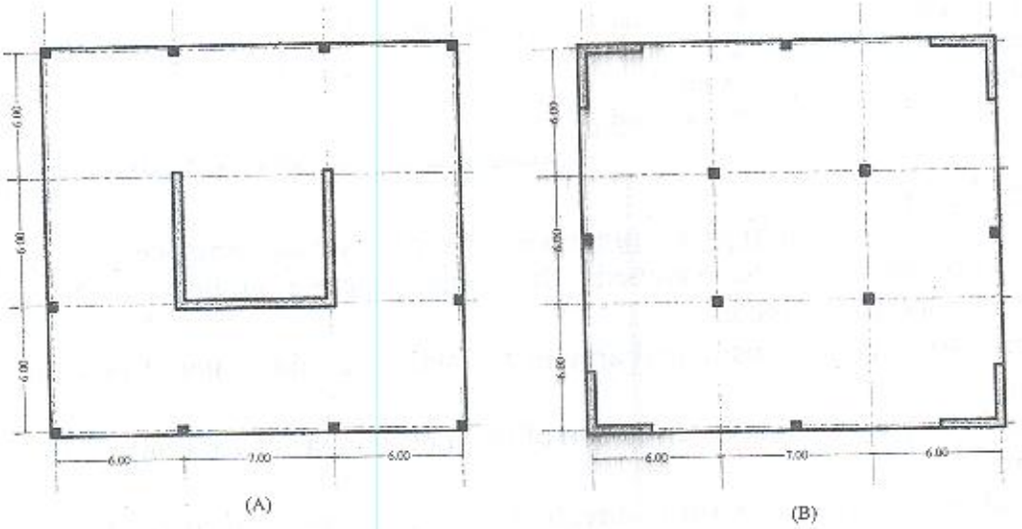


Fig.2

Problem Two (30%)

a- For the shown frame in Fig. 3, it is required to carry out the following:-

- ***Suggest*** suitable cable profile and the prestressing technique.
- ***Check*** of stresses for the most critical section of the girder at service stage.
- If the horizontal load H is alternating its direction (right and left direction), how would you modify the cable profile.

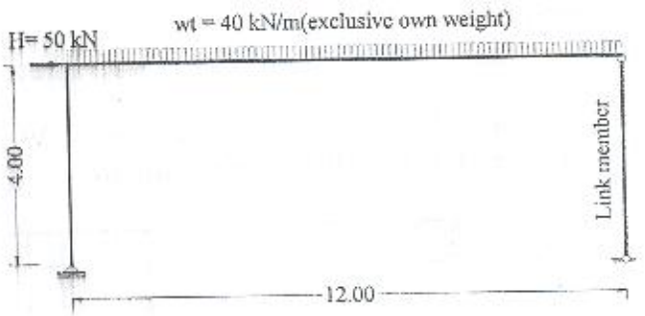


Fig.3

Data

- Girder cross section is 300 mm x 1000 mm,
- Initial prestressing force = 1000 kN,
- Total prestressing losses = 15%,
- Concrete characteristic strength = 50 MPa.

b. It is required to ***derive*** an expression for the hoop stresses, N_θ, for a reinforced concrete dome supported on its lower edge under the action of its own weight. Then ***determine*** the angle at which such stresses reverse its sign.

c. It is required to suggest a general ***layout*** along with ***complete design*** of reinforced concrete dome covering a square area of 32 m side length. The clear height equals to 6 m. The ventilation and natural lighting are very essential.

P.T.O

REINFORCED CONCRETE III
FOURTH YEAR CIVIL
FIRST SEMESTER 08-09
Time Allowed: 4.00 hours

TANTA UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL ENGINEERING DEPT.
FINAL EXAM
الامتحان فى اربع ورقات (لائحة جديدة- هندسة مدنية)

- Systematic arrangement of calculations and neat drawings are essential
- Concrete characteristic strength $f_{cu} = 25$ N/mm^2
- Grade of reinforcing steel is 360/520 N/mm^2
-Any Missing data should be reasonably assumed.

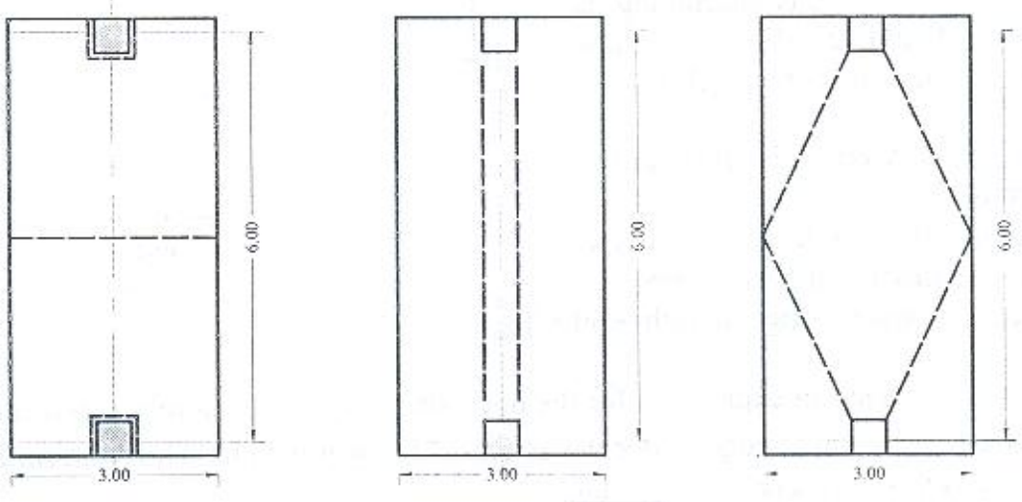
مسموح باستخدام الجداول المعتمدة المسلمة داخل لجان الامتحان

Problem One (25%)

a. ***State*** which sentence is **right or wrong**, then ***correct*** the wrong sentence:

i. For pre-stressed concrete members, the same concrete grades can be used as reinforced concrete members.
ii. The core is preferably positioned around the staircase mid-centered in symmetrical buildings
iii. Structural integrity is considered as one of main design basics for reinforced concrete structures
iv. Structural irregularity in vertical direction such as recess can affect the structural behavior under the vertical loads only.
v. Reinforced concrete water tanks are classified as class four.
vi. For a dome supported on its lower edge, the meridian stresses are always compressive stresses.
vii. Short term losses due to friction can affect both pre- and post-tension prestressing.

b. For the shown sheds in Fig. 1, it is required to ***choose*** the proper probable cracking pattern of the slab at failure and ***comment.***



(A) (B) Fig.1 (C)

c. For the following floor plans in Fig.2, it is required to ***choose*** which system is preferable from the lateral load resisting system viewpoint for tall buildings, ***comment.***

P.T.O

مدنية ١/٤٤

TANTA UNIVERSITY — **4th year Civil**
FACULTY OF ENGINEERING — **COURSE CODE CIH4107**
IRRIGATION AND HYDR. DEPT. — **Time allowed: 3 hours**

DESIGN OF IRRIGATION STRUCTURES (II)
January 2009

Answer as many questions as you can — Any missing data can be reasonably assumed
The exam consists of four questions — Draw net sketches to explain your answers

FIRST QUESTION: **25% of exam. marks**

a) Define the flow net exists below a weir floor due to water head difference. What are the flow net applications for a heading up structure stability?

b) A main canal carries maximum and minimum discharges of 24 and 16.5 m^3/sec. respectively with a corresponding high and low water level of (8.00) and (7.75) respectively. Only two branch canals X and Y are diverted from the main canal at its end by 2 standing wave weirs as canal intakes ($Q_{weir} = 2\ B\ H^{1.5}$). As for canal X, the max. / min. discharges are 14 / 10 m^3/sec. respectively with max. / min. water levels = (7.75) and (7.55).

It is required to:

- Calculate the 2 weirs sill levels. And determine the submergence of the 2 weirs at both max. and min. discharges.
- Sketch the 2 weirs indicating all dimensions if the bed level = (5.00).

SECOND QUESTION: **25% of exam. marks**

An intermediate regulator is to be constructed across a main canal.
Data:

	Upstream	Downstream
Flood water level	15.5	14.80
Bed level	12.30	
Regulator vents number	4	
Regulator vents spans	5 m	
Regulator pier effective length	10 m	
Pier thickness	1.5 m	
Regulator pier own weight	200 ton	

Road bridge (4 main girder) (girder D.L. /L.L. reaction = 6 t. & 5 t. respectively)
Live load on bridge of a truck that has 6 and 11 ton tire loads and 2 m apart.

It is required to

a) Check all cases of the pier stability according to the existing loads.

b) Draw carefully the different calculated stresses on the pier cross section.

THIRD QUESTION: **25% of exam. marks**

Explain using net sketches how to calculate the time required for filling or empting a lock navigation chamber through side culverts.

An unsymmetrical lock will be built beside a head regulator with the following information

	Maximum	Minimum
Upstream water level	10.00	8.50
Downstream water level	8.50	7.00
Lock chamber dimensions	80 m * 20 m	
Bed level	5.00	
Side culvert dimensions	1.75 * 0.75 m on each side	
Time of side culvert gate opening	3 minutes	

It is required to:

a) Find out the required time to fill or empty the lock chamber (*Cd culvert = 0.60*).

b) Check the stability of the guide pier that has 1 m free water height and 3.75 m thickness at the pier base section.

FORTH QUESTION: **25% of exam. marks**

a. A concrete gravity dam will be constructed to store river flood water. Explain (with net sketches) how to estimate all acting forces on the dam body assuming maximum water height at U.S. and D.S. H and h (m) respectively. Describe the required dam stability checks to prevent failure chances.

b. Collected annual river inflow rates (I) in Million m^3 during 20 years period are presented in the following Table. A reservoir is planed to save such water in a multi annual storage.

- Calculate analytically the reservoir storage capacity.
- Use the (1961-1969) period inflow data to find out the reservoir storage capacity graphically.

Year	I Mm^3	Year	I Mm^3	Year	I Mm^3	Year	I Mm^3	Year	I Mm^3
1950	67	1954	70	1958	55	1962	75	1966	80
1951	55	1955	60	1959	68	1963	65	1967	72
1952	65	1956	40	1960	48	1964	52	1968	55
1953	75	1957	48	1961	70	1965	42	1969	65

Best wishes Dr. Ahmed Rashed

تخصصي اختياري ٤ ٢٢/١
تحسين التربة

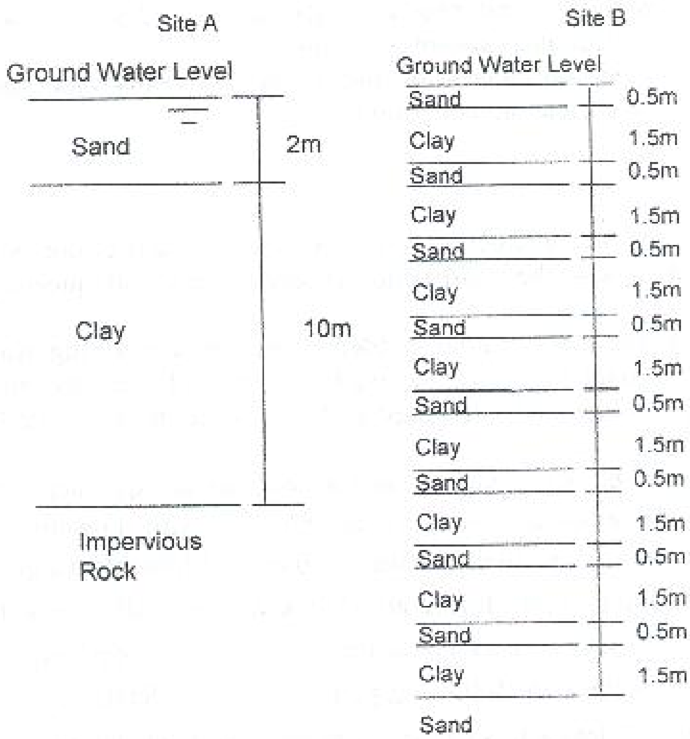
Tanta University
Faculty of Engineering
Structural Engineering Department

Elective Course (4): Soil Improvement
First Term Exam 2008-2009
Fourth Year Str. Engineering_لائحة قديمة

<u>**Answer all the following questions.**</u>
<u>**Any missing data to be reasonably assumed.**</u>

<u>Question No. 1 : (14 Points)</u>

a) What are the three categories of soil improvement?
b) Give three examples of problematic soil and discuss why these soils are problematic.
c) Discuss giving examples the concept of quality control in soil improvement process.
d) What are the most suitable methods to improve the following two soil profiles?



<u>Question No. 2: (14 Points)</u>

a) What is Dynamic Compaction?
b) In what type of Soil, dynamic compaction is most suitable?
c) Briefly discuss three possible site restrains for the dynamic compaction process.
d) A three-story structure with relatively light load was planned over 8000 m^2 site. The initial subsurface exploration indicated a 9 m thick layer of loose silty sand over hard or stiff layer. The sand layer had sinkholes and voids due to dissolution of a limestone formation. There was a large amount of heterogeneity in the subsurface profile throughout the site, which led to large predicted differential settlements. The ground water table was 3 m deep below the ground surface. <u>Recommend (with reasoning) two alternative techniques</u> to improve the soil in the described project.

Question No. 3: (14 Points)

a) **Illustrate** briefly the reasons behind the need for improvement of soft clays for foundation applications.
b) Where do soft clay deposits dominate in Egypt.
c) **Explain** briefly the concept behind improvement of soft clays by preloading.

Question No. 4: (14 Points)

a) **Define** what is meant by vacuum consolidation. Using clear sketch, differentiate between Vacuum method and classical surcharge to be used for soft clay improvement.
a) Using clear sketch, **show** the measures to be considered in the case of vertical drains improvement of deep marine soft clay deposits overlain by granular layer.
b) **Explain** briefly with clear sketch the monitoring techniques to be used in the case of soft clays improvement by vertical drains and vacuum preloading.
c) Using clear sketches **show** the advantages of the vacuum consolidation technique comparing with the technique of preloading with drains.

Question No. 5: (14 Points)

a) Using only clear sketches show the construction consequence and details of one geotextile layer in a geotextile wall. Show also the construction procedure and consequence for the overall wall.
b) From the first principles, derive the formulas needed to design a retaining wall with geotextile reinforcement. The total height of the wall is to be "H" and the allowable strength of the geotextile fabric intended to be used is "σG", while the available backfill material has the properties of "γ", "φ".
d) A retaining wall of 4.0 high is to be constructed to carry a road with an equivalent traffic L.L. of 1.0 t/m^2 using geotextile reinforcement. A woven geotextile with allowable wide-width tensile strength of 0.73 t/m can be used. The wall is to be backfilled with a granular material that has γ_1=1.76 t/m^3 and φ_1= 36°. It is required to design the wall considering a safety factor of 1.5. It is required also to check the factor of safety against overturning and sliding of the wall if the *in situ* soil has the following parameters: γ_2= 1.8 t/m^3, φ_2 = 15° and c = 0.25 kg/cm^2. Draw in full details to an appropriate scale the final chosen dimensions of the geotextile layers and the wall.

Best Wishes.....

ع صرية هندسة الطرق جديد

Tanta University
Faculty of Engineering
Public Works Department
4th Year, Structural Engineering

Final Exam
2008-2009
Time : 3 Hours

Highways Engineering

* Try all questions, if possible *Assume reasonably any missing data
*Use clear and net sketches to illustrate your answers as much as you can

يسمح باستخدام الجداول والمنحنيات الخاصة بالمادة

Question (1)

a. Write briefly what is meant by the following terms:
1. Degree of curve 2. Stopping sight distance
3. Degree of saturation 4. Plate loading test **(4 Marks)**

b. The weight of a soil sample having a volume of 44.8 cm^3 is 85.4 gm. After oven drying reduces to 76.4 gm. Find the degree of saturation if the volume of specific gravity is 2.66. What would be the water content at full saturation? **(6 Marks)**

c. A circular curve connects two tangents (*2-lane undivided highway*) that deflect at an angle of 54°. If the point of intersection is at station (347+38.5), design speed is 70 mph and superelevation is 8%.
i) Determine the station of PC, PT and the deflection angles for setting out the curve at 100 ft stations from PC.
ii) Draw to a reasonable scale, the progress of obtaining the required superelevation when revolving the pavement around the centerline of the pavement. **(10 Marks)**

d. A corner of a building is 36 ft from the centerline of a curved section of a 4-lane rural highway. If this section has a grade of 5% and the radius of the curve is only 320 ft, what speed limit will you recommend at this section if :
i. The highway has no median,
ii. The highway has an 8 ft median. **(8 Marks)**

e. A vertical curve connects a (–1.5%) with a (+2%) grade. If the design speed of the highway is 60 mph, compute the elevation of the curve at 100ft stations. Grades intersect at station 263+16 at an elevation of 90ft. **(6 Marks)**

f. An existing vertical curve joins two grades. Grades intersect at station 110+92.5 at an elevation of 947.11ft. The station and level of PC are 109+00 and 950 ft. The station of the low point is 110+65. What is the max. safe speed ? **(6 Marks)**

Question (2)

a. A horizontal curve is to be connected to a tangent in a 70 mph design speed highway using a spiral curve:

a) Find the radius of the horizontal curve for a superelevation of 8%.

b) For the spiral curve find:

1. The length of the spiral
2. The TS and SC stations if the PI is located at station (190+63)
3. The deflection angle at SC

(10 Marks)

b. An existing vertical curve joins a +4% grade to –2.5% grade. If the length of the curve is 250 ft. Grades intersect at station 340+00 at an elevation of 1323ft. What is the max. safe speed ?

(5 Marks)

c. A flexible pavement for an urban highway is to be designed using AASHTO to carry ESAL of $2*10^6$. It's estimated that:

Resilience modulus of asphalt = 450000Ib/in^2

CBR value of base course = 100 and M_R = 31000 Ib/in^2

CBR value of sub-base course = 22 and M_R = 13500 Ib/in^2

CBR value of sub-grade = 6, M_R = 31000 Ib/in^2

It is required to determine the AC, base and sub-base layer thicknesses for the pavement system

(10 Marks)

d. The results of a CBR test conducted on a two base materials are shown below for the two soils:

Penetration (inch)		0.1	0.2	0.3	0.4	0.5
Load in psi	Soil A	550	700	800	850	900
	Soil B	210	500	700	800	850

- Draw the load-penetration relationships for two soils.
- Determine the value of CBR for the two soils.
- Choose one of the two soils to use as base. **(8 Marks)**

GOOD LUCK

Dr. Islam Abu El-Naga

Tanta univ. *Faculty of Eng.* *Public works Eng.Dept*	*First term Exam* *jan.2009*	*Sanitary Eng.* *4th year civil Eng* *Time: 3 hrs.*

1 - For a waste water treatment plant of 10,000 m^3/d design discharge,determine the grit chamber dimensions according to the following data :

- channel depth = 1.5 width
- horizontal flow through velocity = 0.3 m/s
- particles settling velocity = 0.02 m/s

It is also required to design a primary sedimentation tank to remove approximately 65% and 35 % of suspended solids and BOD respectively , with retention period of 2.5 hrs .

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2 – a) Fig . (1) illustrates dimensions of a typical slow mixing unit installed to apply tapered flocculation of average G value of 35 sec^{-1} and GT value of 4×10^4 , with typical Alum.dose of 40 mg / lit (According to jar test analysis).
If two units are used to handle 12,000 m^3 /d of raw water, it is required to determine :
Unit dimensions, power requirements, paddles configuration and rotational speed (ω).

2- b) For the discharge in (a) , its required to determine :

- the rate of dosing of Alum. solution in lit / min
- if Alum concentration in solution C = 10 %
- the required amount of Alum . per day.
- the required capacity of the alum. solution tank Sufficient for one day .

Hint : $P = G^2\mu V$ $\mu = 1.139\times10^{-3}$ N.S / m^2 $\rho = 999.1$ kg/m^3
$C_D = 1.8$
$P = C_D A_p \rho V_P^3 / 2$ $V_P = 0.67$ m /sec x 0.75 = 0.5m/s

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3-a- A City has present population p_{2000} of 33,000 capita and estimated future population P_{2020} of 50,000 capita . If the city present water consumption is 10,000 m^3 / d determine at what year a 14,000 m^3 / d , design discharge water treatment plant will reach its full capacity . Assume an arithmetic rate of population growth and constant per capita water consumption .

3-b- A Conventional Activated Sludge WWTP is to treat 15,000 m^3/d wastewater, the raw wastewater has BOD_5 of 1080mg/lit that required to be reduced to 200mg/lit. Primary and final sedimentation tanks is 500 , 750 m^2 effective surface area respectively. Analysis indicates a mean cell residence time of 5 days maintaining Mixed Liquor Suspended Solids of 4000PPM will produce the design results. The value of Y is 0.7 and K_d is found $0.03d^{-1}$.
You are required to determine the mass of solids, and volume, of activated sludge to be wasted daily, the sludge recirculation ratio (Knowing that X_u = 12000 mg/lit), also determine S.L.R for the edimentation tanks.

Hints : $P_n = P_o + K_a(t_n - t_o)$ $V = QY\,\theta_c (S_o - S_e)/ X(1+K_d\theta_c)$

good luck
Dr. Ahmed Elmorsy

4-a- Discuss the conditions that should be considered when choosing the location and type of an intake for a city water supply.

4-b- For a city of population 200,000 capita and annual average water consumption 300 L/c/d it is required to choose and design all element for a suitable type of intake . If the source is a navigable canal of width 200 m , water level at (18.00) m , bed level at (14.50) , ground level at (18.50) , road level at (19.00) m and the rapid mixing tank water level at (35.00) m . The distance between the low lift pump and rapid mixing tank is 3500 m and the minor losses is 2 m . (f = 0.01) . ($hf = f\,l\,v^2/2gd$)

5- a- Explain the different zones in sedimentation tank for water treatment plants .

5- b- It is required to determine the number ,dimensions and the net water production of clari-flocculators for a water treatment plant , given the following data :

- p	240,000capita	- q	280lit/capita/day
- Tsed.	2.5 hours	- Tfloc.	0.5 hour
- Working period of treatment plant	20hours/day		
- Surface loading rate	$\geq 30\ m^3/m^2/d$		
- Suspended solids	120 mg/L		
- Efficiency of sedimentation Tank	85 %		
- Water content in sludge	96 %		

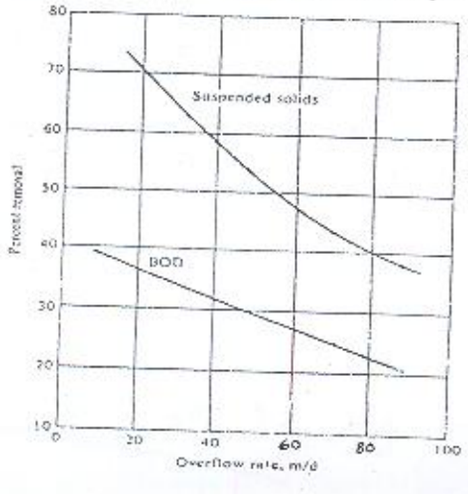
5- c- If is previous census of the city was as follows :

year	population
1975	195,000
1985	205,000
1995	220,000
2005	240,000

Assume the population increase in future will follow the geometric method ($\ln P_t = \ln P_o + K_g (t_n - t_o)$) , what would be the number and dimensions of the required additional clari-flocculators after 30 years . Assume the same design data regading water consumption , retention periods , surface loading rate and working period.

6- a- Give short notes for the different types of filters according the following items : direction of flow , filtration rate , filter media .

6- b- A rapid sand filter unit 6 x 8 m . After filtering 10,000 m^3/d in a 24 hr period , the filter is backwashed at a rate 500 $m^3/m^2/d$ for 12 min. Calculate the average rate of filtration , the quantity and percentage of treated water used in washing.



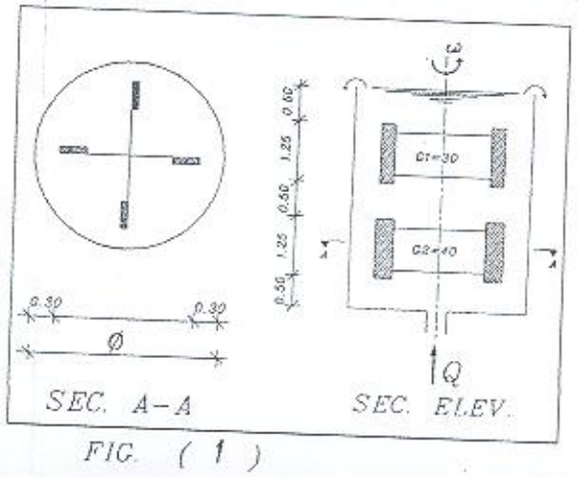


FIG. (1)