Problem number (5) **(11 Marks)**

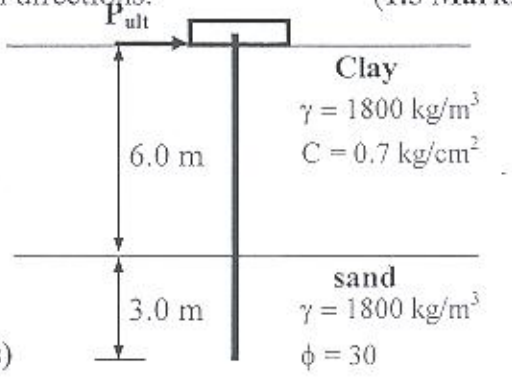
a) Explain how to determine the dynamic load acting on the footing due to the machine vibration. **(1.5 Marks)**

b) Discuss in details how to design the machine foundation illustrating the main points which should be considered in the design . **(1.5 Marks)**

c) Illustrate how to measure the shear modulus in the field. **(1.5 Marks)**

d) Illustrate how to determine the maximum and minimum loads in unsymmetrical pile group subjected to vertical load and moments in both directions. **(1.5 Marks)**

e) For the steel circular pile shown in the next figure
If the yield stress of pile material = 360000 kN/m^2
and the outer and inner diameters of pile are 45 and 43 cm respectively.
Find out the maximum horizontal load can be resisted by this pile. **(5.0 Marks)**



Problem number (6) **(11.0 Marks)**

A structural graduate engineer married a pretty civil graduate engineer in 1990. They built their own house which consists of four typical floors hoping that they will have three children in the future. Unfortunately, they have 7 kids and all of them are boys. So, they need four additional typical floors. The husband has collected all the required date to check the stresses under the raft as follow:

- The plane concrete thickness = 0.30 m
- The thickness of reinforced concrete = 0. 90 m
- The unit weight of soil = 1700 kg/m^3
- The raft is 12 x 15 m with the long side in X direction
- The foundation level = 2.0 m
- The allowable net stress at foundation level=1.0 kg/cm^2
- The load of one floor = 250 t acting in the right 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 direction = 300 tm.

Using detailed calculations you are asked to tell the husband:

(a) The maximum stress under the raft under vertical loads only of four floors **(4.0 Marks)**

(b) The maximum number of typical floors that the soil can support safely for the case of both vertical and lateral loads **(4.0 Marks)**

(c) If the wife is blaming her husband as he refused to construct basement floor. She thinks if they constructed a basement floor, she may have more trials to have a beautiful baby girl. If the foundation level in this case would be 4.5 m and the allowable net stress at foundation level =1.10 kg/cm^2 , you are asked to tell the wife the maximum number of typical floors that the soil can support safely for the case of vertical loads only **(3.0 Marks)**

Course Examination Committee

Dr. Mostafa El Sawwaf Dr. Ashrf Kamal Nazir

رابعة إنشاءات لائحة قديمة
هندسة صحية عامة

Tanta Univ.
Faculty of Eng.
Public works Eng.Dep.

First term Exam
Jan.2011

Sanitary Eng.
4th year Civil Eng.
Time : 3.0 hrs

Question 1

(a) A water source has a maximum water level at (10,00) m and the distance to water treatment plant is 2000 m. It is required to transport 0,35 m^3/sec of water from the source to the rapid mixing tank with the water level(20,00)m. by using the low lift pumps with total horse power (216Hp) and $\zeta_1 \ \zeta_2 = 0{,}65$. Determine the diameter of the main pipe connecting between the source and R.M.T, (C=100,secondary losses –20% friction losses).

(b)- For water purification plant of discharge 75700 m^3/d, Pilot plant analysis on mixed media indicates that filtration rate of 5 m/h will be acceptable, Assuming a surface configuration of approximately 6.25 * 8 m. How many filter units will be required?

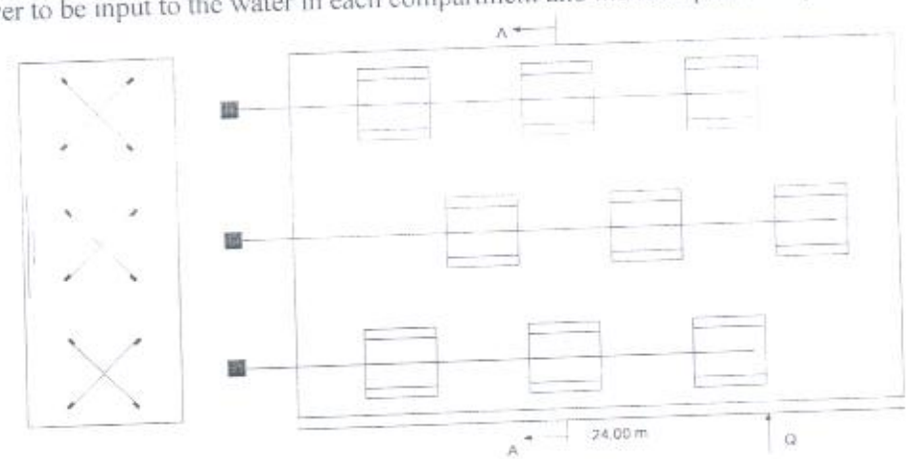
- Allow two units of service for back washing, Determine the net water production of each filter if backwash period requires 15 min, and the ripening period is 10 min.

Question 2

A flocculator basin is to be designed for a water purification plant with a design flow of 50,000 m^3 /day. The basin is to be a cross-flow horizontal-shaft, paddle with a mean velocity gradient of 30 sec^{-1} and a detention time of 30 minutes, Tapered flocculation is to be provided and three compartments of equal depth in series are to be used as shown in the figure, The G values are 40, 30 and 20 sec^{-1}. The outside blades should clear the floor by 0,3 m and be 0,3 m below the water surface, There are to be four blades per paddle, Adjacent paddles should have a clear spacing of 0,5 m together with the wall clearance (V_{act} for the first compartment is 0,65 m/sec)
(at 10°C, $\mu = 1{,}3 * 10^{-3}$ Ns/m^2 , and $\rho_w = 999{,}3$ kg/m^3).

Determine:

1- The basin dimensions.
2- The paddle design and rotational speed.
3- The power to be input to the water in each compartment and the total power required for basin.



Sec A - A

Question 3

For a city of population 80000 capita and water per capita consumption 300 L/c/d. There are two available cases of working.

- In case 1 working period 6 A.M - 10 P.M
- In case 2 working period 6 A.M - 8 P.M

* Which case 1 or 2 will be economic to be applied?

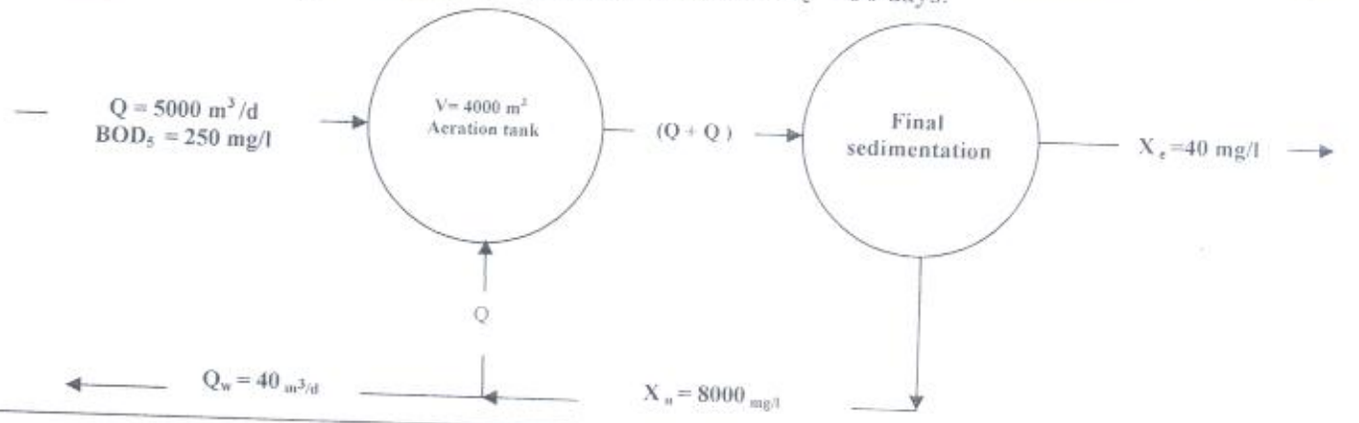
If the cost of increasing 1 m^3/hr = 500 L.E & of saving 1 m^3 storage = 50 L.E

Time	*Rate, Lit/hr*	*Time*	*Rate, Lit/hr*
12M,N -2	2	12N -2	23
2 -4	2	2 -4	18
4 -6	3	4 -6	23
6 - 8	8	6 -8	8
8 - 10	27	8 - 10	4
10 - 12 N	29	10 -12M.N	3

Question 4

(a) - A grit chamber is designed to remove particles with diameter of 0,2 mm, specific gravity 2,65, settling velocity for these particles has been found (0,02) m/sec depending on their shape factor,
A flow through velocity of 0,3 m/sec will be maintained by the proportional weir, determine the channel Dimensions for maximum wastewater flow of 8,000 m^3/sec.

(b)- Determine an effluent BOD5 and the recirculation flow to be expected from an aeration tank treating sewage with a BOD_5 of 250 mg/ l - Assume Y = 0,65, K_d = 0,05 and Θ_c = 30 days.



Question 5

The following data were collected during field evaluation of an existing conventional activated sludge secondary treatment plant treating municipal wastewater:

Number of aeration tanks	= 10
Dimensions on aeration tank	= 40 ms length 6 ms width 4 ms liquid depth
Influent wastewater	= 18800 m^3/day
Recirculated sludge	= 4000 m^3/day
Wasting sludge	= 16500 m^3/ day
BOD_5 of primary treated waste	= 450 mg /lit
BOD_5 of final clarifier effluent	= 50mg /lit
Under flow concentration (Xu)	= 10,000 mg/lit

a) use the above data to calculate the following :-

- Retention period.
- Mixed liquor suspended solids.
- F/M ratio, volumetric loading.
- Mean cell residence time

b) Is the volume of aeration basins sufficient. If not , estimate the number and dimensions of the required additional tanks. (If the maximum allowable F/M is 0,25 kg BOD5 /kg MLSS).

Question 6

- A city having a present population of 90,000 capita and an average water consumption of 300 l/c/d. It is required to determine the number and dimensions of rapid sand filters if the treatment plant is working 16 hours daily, (rate of filtration 120m^3 /m^2/d)
- If the population of such city will be increased to 170,000 capita after 40 years, and the plant will work 24 hours daily, would the previously designed units be suitable to meet the filter requirements? Determine how many additional units, if any, of the same designed dimensions will be needed if the maximum filtration rate is 160 m^3 / m^2/d.

Notes : $v = 0{,}355\ Cd^{0.63}\ S^{0.54}$

volume of aeration tank = $\dfrac{Q\,y\,\Theta_c\,(S-S_e)}{X(1+k_d\,\Theta_c)}$

Power = $P = C_d\,\rho_w\,A_p\,\dfrac{V_p^3}{2}$ P watt ,(Nm/S) $G = \sqrt{\dfrac{P}{\forall \mu}}$

Good luck
Dr. A . El morsy

هندسة إنشاءات (قديم)
مقرر اختياري تخصص (٢١) ألياف خرسانية

Tanta University	Department: Structural Engineering Total Marks: 70 Marks	Faculty of Engineering

Course Title: fibrous concrete	Course Code: CS**17	Year: 4th -old bylaw
Date: January 2011	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions… arrange your answer booklet)

السؤال الأول (٢٥ درجة)

١- اذكر اهم اشتراطات صلاحية الالياف للاستخدام فى الخرسانة ثم اذكر الانواع المتاحة التى يمكن استخدامها لتسليح الخرسانة .
٢- قارن بين كل من الخرسانة العادية و الخرسانة المسلحة بالالياف من حيث التعديلات التى تأخذ فى الاعتبار فى تصميم الخلطات .
٣- فسر كل من ظاهرة تكور الالياف و ظاهرة الهواء المحبوس داخل الخرسانة و كيف يمكن التغلب على كل من هذة الظواهر.
٤- اشرح اختبارا قياسيا لقياس تشغيلية خرسانة الالياف.
٥- اذكر أهم مزايا وعيوب الخرسانة التقليدية كمادة إنشائية محدداً كيف يمكن الاستفادة من مزاياها وكيف يمكن التغلب على بعض هذه العيوب. ثم اشرح باختصار ومبتدءا بمكونات الخرسانة التقليدية وعن طريق تغيير واحد أو أكثر من مكونات الخلطة أو بتغيير نسب الخلط أو إضافة مركبات جديدة أو بتغيير طرق الصناعة ...الخ وضح كيف يمكن الحصول على أنواع خاصة من الخرسانة ذات خواص مميزة محدداً التطبيق الأمثل لاستغلال تلك الخواص المميزة المصاحبة لكل نوع.
٦- فرق باختصار بين طرق قياس متانة خرسانة الألياف في الانحناء.

السؤال الثانى (٢٥ درجة)

١- عرف كل من المواد Isotropic و Orthotropic و Anisotropic و كيف يمكن تحقيق ذلك فى خرسانة الالياف.
٢- استخدمت الياف حديدية لها مقاومة شد ١٠٠٠٠ كجم/سم^{٢} و معاير مرونة ٢١٠٠ طن/سم^{٢} فاحسب مقاومة المادة المركبة فى الحالات الثلاثة Isotropic و Orthotropic و Anisotropic اذا كانت المادة اللاحمة لها مقاومة شد ٣٠ كجم/سم^{٢} و معاير مرونة ٢٠٠ طن/سم^{٢} و ذلك بافتراض ان الطول اكبر من الطول الحرج و تستخدم بشكل متقطع مع المادة اللاحمة و بمحتوى ١ % بالحجم.
٣- تم اختبار مجموعتين من عدة عينات متماثلة المجموعة الأولى عبارة عن كمرات من الخرسانة التقليدية والأخرى من نفس الخلطة بعد إضافة ١% بالحجم من نوع معين من الألياف القصيرة بطول ٣٠مم وكانت العينات بمقاس ١٠٠*١٠٠*٣٥٠مم حيث تم اختبارهما في الانحناء بحملين عند نقطتي الثلثين فإذا علمت أن متوسط أحمال حد التناسب كانت ١٤ ، ١٧ ك.ن للخرسانة التقليدية وخرسانة الألياف على الترتيب وان متوسط قيم ترخيم حد التناسب كانت ٠.٠٤ ، ٠.٠٤٨٣مم لكلا المجموعتين على الترتيب.

المطلوب:

أ. احسب كل من متوسط معاير المرونة في الانحناء ومقاومة الشد في الانحناء للمجموعتين.
ب. أحسب محتوى الألياف المستمرة من نفس نوع الألياف المستخدمة والتي تعطى نفس قيم معاير المرونة و مقاومة الانحناء للحالة المختبرة سابقاً.

٤- ارسم العلاقات التوضيحية الاتية:

- العلاقة بين مقاييس التشغيلية للخرسانة المسلحة بالالياف
- العلاقة بين مقاومة الضغط للخرسانة المسلحة بالالياف و الخرسانة العادية باستخدام نسب و اطوال مختلفة من الالياف
- تأثير كل من محتوى الالياف و نسبة النحافة على مقاومة الانحناء
- ثاثير استخدام الالياف

السؤال الثالث (٢٥ درجة)

١- اجرى اختبار الضغط على اسطوانات قياسية من الخرسانة وطول القياس المستخدم ١٠٠مم وكانت قراءات الحمل (طن) والانضغاط ($\times ١٠^{-٢}$ مم) المقابل كما يلى:

الحمل (طن)	٩	١٨	٢٧	٣٦	٤٥	٥٤	٥٧.٦	٤٥	٤٠.٥	٣٦	٣٢.٤	٣٠.٦
خرسانة عادية	٢.٥	٥	١٠	١٥	٢٢.٥	-	-	-	٢٧	٢٨.٥	٣٠.٠	٣٠
الياف بولى بروبلين ٠.٥%	٢.٥	٥.٥	٩	١٣	٢٠	-	-	-	٣٣	٣٩	٦٠	٧٥
الياف حديد ٠.٥%	٢.٣	٤.٧٥	٨	١٢	١٦	٢٥	٣٩	٥٠	-	٥٥	٧٠	٩٠

- أرسم منحنى الاجهاد و الانفعال للثلاث انواع من الخرسانة - احسب قيمة معاير المرونة للثلاث انواع من الخرسانة.

٢- عدد الاستخدامات المختلفة للالياف ثم اشرح بالتفصيل تطبيق لاستخدام الالياف فى مجال من المجالات المعملية مع التوضيح بالرسم كلما امكن .

مع تمنياتنا بالتوفيق ،،،

د/ مريم فاروق غازى و اللجنة

Tanta University

Department: Structural Engineering
Total Marks: 70 Marks

Faculty of Engineering

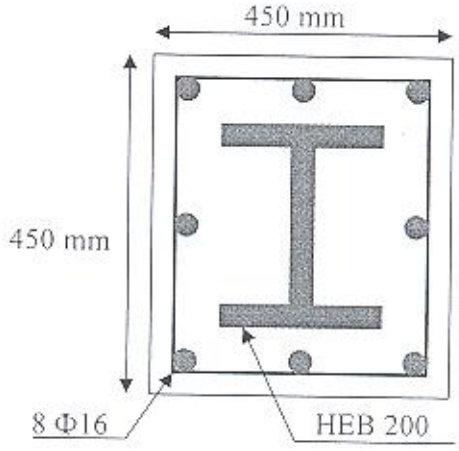
Course Title: Composite Structures	Course Code: CSE 4248	Year: 4th
Date: Jan 2011 (First term)	Allowed time: 3 hrs	No. of Pages: (1)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches…etc)

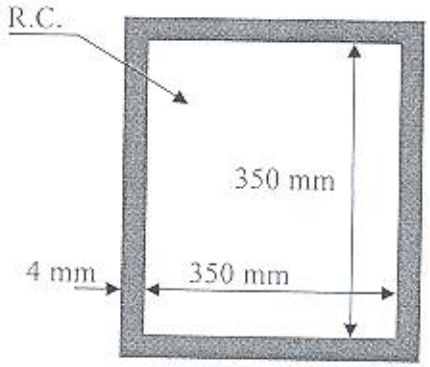
1. A steel beam is supporting a concrete slab of 10 mm thickness. Spacing between beams is 2 m. The beam span is 8m. Use live load = 300 kg/m2 and flooring cover = 150 kg/m2. It is required to:
   a. Design the beam as steel section only. **(6 marks)**
   b. Design the beam as a shored composite section. **(6 marks)**
   c. Design the beam as an unshored composite section. **(6 marks)**
   d. Draw the normal stress distribution for both shored and unshored cases. **(3 marks)**
   e. Design the stud shear connectors for the composite section. **(3 marks)**

2. Draw with neat sketches different types of connectors. **(6 marks)**

3. Find the maximum axial force that can be applied on an encased composite column with the given cross section (450X450). Column length = 6m, K = 1.0, F_{cu} = 250 kg/cm^2, Steel used is HEB 200 of St 37, Steel reinforcement is 8 Φ 16 of St 52. **(20 marks)**



4. Check the shown infilled composite column for an axial force of 50 ton and a bending moment of 4 ton-m. Column length = 4m, K = 1.2, F_{cu} = 250 kg/cm^2, Steel used is St 37. **(20 marks)**



Course Examination Committee

Prof. Dr. Mohamed Dabaon Dr. Mahmoud El-Boghdadi and the Committee

Course Coordinator: Dr. Mahmoud El-Boghdadi

Tanta University

Department: Structural Engineering
Total Marks: 70 Marks

Faculty of Engineering

Course Title: Design of Steel Bridges	Course Code:CS4102	Year: 4th
Date: Jan 2011 (First term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches…etc)

A double-track open timber floor railway pony bridge has a span of 27 m divided into 6 equal panels. The main girders are welded plate girders having a depth of 270 cm and a flange width of 55 cm. The main girders are provided with vertical stiffeners every 1.5 m together with a horizontal stiffener at 1/5 the depth from the compression side. The bridge is provided with a lower K-system bracing and with a U-frame at every cross girder.Material of construction is St. 44 with a yield stress F_y = 2.8 t/cm^2 and Young's modulus E=2100 t/cm^2. Live load is train type D.

REQUIRED:

1. Using influence lines, find the max. B.M. and max. positive S.F. at section (6.75 m from support of main girder) due to L.L. plus impact only. **(8 Marks)**

2. Calculate the max. B.M. and max. S.F. acting on an intermediate stringer due to dead load, live load and impact, then design a suitable section for it. **(8 Marks)**

3. Design the connection between the stringer and the cross girder and draw it in elevation and plan to scale 1:10. Use M22 H.S. Bolts (Friction Type) of Grade 10.9. **(16 Marks)**

Cross-sections properties		h (mm)	b (mm)	t_f (mm)	t_w (mm)
Stringer	I.P.E. 360	360	170	12.7	8.0
Cross Girder	B.F.I.B. 900	900	300	35.0	18.5

4. Design a welded plate girder section for the main girder if: f_{sr} = 1.26 t/cm^2. M_D = 250 m.t, M_L = 800 m.t, I = 24 / 24+nl, Q_D = 45 t, Q_L = 140 t. Plates of thicknesses 12, 14, 22, 36 & 50 mm only are available for the construction of the main girder. **(16 Marks)**

5. Check the buckling of the web plate in the critical sub-panels only under pure shearing stresses (at panel near support where Q at mid-panel ≈ 0.944 Q_{D+L+I}) and under pure bending stresses at panel near mid-span. ($k = 4.0 + 5.34/\alpha^2$ for $\alpha \le 1.00$ for critical shear stress). **(8 Marks)**

6. Design the intermediate stiffener at the connection with the cross girder (at 3.0 m from support). You have to calculate the max. S.F. at the position of the stiffener. **(8 Marks)**

$$C_s = 0.65\left(\frac{0.35F_y}{q_b} - 1\right)Q_{act} \quad \text{cm t units;} \quad q_b = 0.729 \text{ t/cm2.}$$

7. Consider 3 panels of equal area but with aspect ratios 0.5, 1.0 and 2.0; determine which one is the worst shape for buckling under pure shear stresses. **(8 Marks)**

P.T.O.

تحليل منشآت متقدم لإدارة انشاءات

TANTA UNIVERSITY — STRUCTURAL ENGINEERING DEPARTMENT — FACULTY OF ENGINNERIN

Advanced Structural Analysis
Fourth Year 2010-2011
Allowed time: 3 hrs — Total Marks: 70 Marks

Course Code: لائحة قديمة
January 2011
No. of Pages: (3)

Question II (8 Marks)

Using the stiffness matrix method, determine the joint displacements, the reactions at the supports and the force in each member of the plane truss shown in Fig. 1 due to the given loads. EA/L = 200 t/cm for all members.**(8 Marks)**

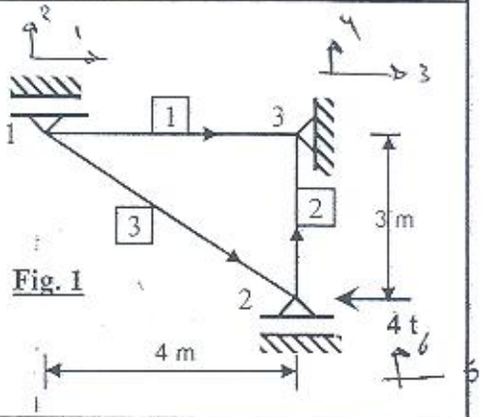


Fig. 1

Question II (15 Marks)

Fig. 2 shows a frame is subjected to a concentrated load (EI = 30000 t.m^2 and EA = 15000 t for all members). It is required to:

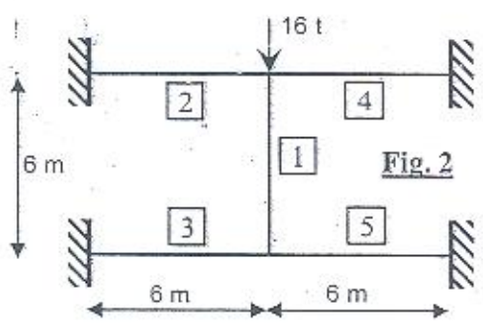


Fig. 2

1. Use symmetry to simplify the shown frame.**(4 Marks)**
2. Using the stiffness matrix method, determine the joint displacements and draw the normal force, shearing force and bending moment diagrams. **(8 Marks)**
3. Without calculations, draw the bending moment diagram of the frame if the EA of the element 1: (a) equals zero (b) equals infinity (∞).**(3 Marks)**

Question III (15 Marks)

The truss element shown in Fig. 3 is prismatic and has two nodes 1 and 2. The assumed axial displacement function is $u = c_1 + c_2 x$. It is required to:

Fig. 3

- Find the constants c_1 and c_2 in terms of u_1 and u_2.**(4 Marks)**
- Draw clear sketches for the shape functions.**(4 Marks)**
- Determine the strain-displacement matrix [B].**(4 Marks)**
- Determine the element stiffness matrix [K] in terms of E, A, and L.**(3 Marks)**

Question II (12 Marks)

A constant strain triangle is shown in Fig. 4. The nodal displacements at the three nodes of the element are known and given below. It is required to:

1. Find the value of the displacements (u and v) at the centroid of the element.**(4 Marks)**
2. Find the value of the displacements (u and v) at the mid-point of the line connecting Node 1 and Node 2.**(4 Marks)**
3. Determine the strains ($\varepsilon_x, \varepsilon_y, \tau_{xy}$) at the centroid of the element.**(4 Marks)**

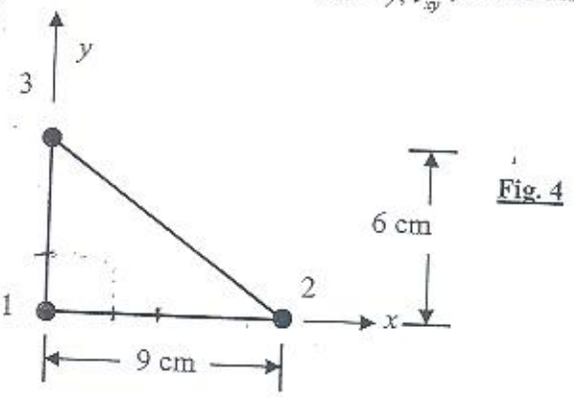


Fig. 4

Given:
E=2100 t/cm^2
$\mu = 0.3$
t = 10 cm

Nodal Displacements

$u_1 = 0.0$ mm	$v_1 = -2.0$ mm
$u_2 = 8.0$ mm	$v_2 = -4.0$ mm
$u_3 = 2.0$ mm	$v_3 = 0.0$ mm

Question II (10 Marks)

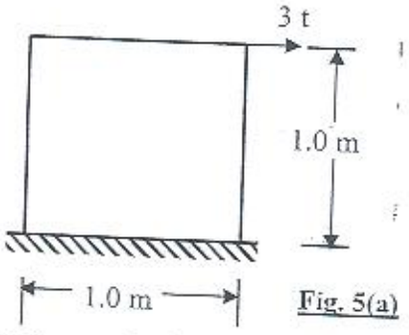


Fig. 5(a)

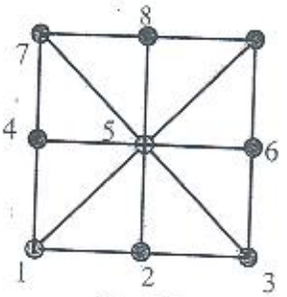


Fig. 5(b)

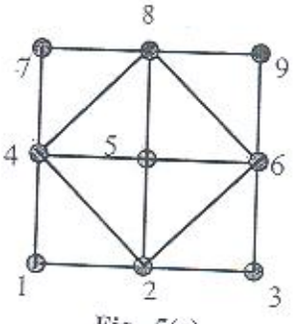


Fig. 5(c)

Fig. 5a shows a 1×1 m steel plate with a thickness of 10 cm. The plate is fixed against a rigid floor. The plate needs to be analyzed to calculate deformations and stresses using the 2D finite element mesh shown in Fig. 5b or in Fig. 5c. The mesh consists of 8 CST elements.
It is required to:

1. Mention the type of analysis required for obtaining the required results (plane stress or plane strain)? Explain your answer and define the cases of plane stress and plane strain.**(4 Marks)**
2. Sketch the mesh shown in Fig. 5b showing the appropriate boundary conditions at all nodes.**(3 Marks)**
3. Explain which mesh in Fig. 5b or Fig. 5c gives more accurate results. **(3 Marks)**

Question III (18 Marks)

Consider the two-dimensional 3-element system shown in Fig. 6. Element 1 is a constant-strain triangle while elements 2 and 3 are truss elements. The structure is completely supported at nodes A and C. The stiffness matrix of Elements 1 is given below.

1. Assemble the global system stiffness matrix, K considering all possible degrees of freedom. **(5 Marks)**
2. Solve to get the displacements. **(3 Marks)**
3. Find the stress at the center and at the middle point of side AC of the element 1. Are they equal or not? Why?. **(4 Marks)**
4. Find the normal force of Element 2. **(3 Marks)**
5. Without calculations, find the normal force in Element 2 and 3 if the thickness of the CST approaches zero. **(3 Marks)**

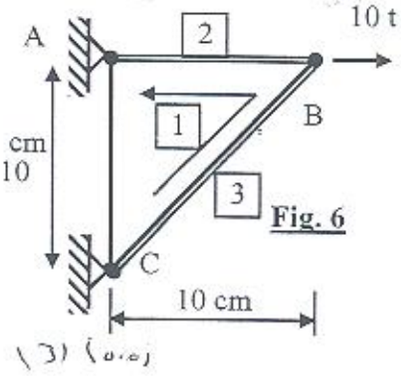


Fig. 6

Connectivity Table

Element	i	j	k
1	C	B	A
2	A	B	

For Truss Element
EA=1000 t
For CST
E = 250 t/cm^2
t = 1.5 cm
ν = 0.25

$$k^{(1)} = \begin{bmatrix} 75 & 0 & 0 & -75 & -75 & 75 \\ 0 & 200 & -50 & 0 & 50 & -200 \\ 0 & -50 & 200 & 0 & -200 & 50 \\ -75 & 0 & 0 & 75 & 75 & -75 \\ -75 & 50 & -200 & 75 & 275 & -125 \\ 75 & -200 & 50 & -75 & -125 & 275 \end{bmatrix} \text{ t/cm}$$

The Global Stiffness Matrix of a Truss Element

$$K = \frac{EA}{L}\begin{bmatrix} c^2 & cs & -c^2 & -cs \\ cs & s^2 & -cs & -s^2 \\ -c^2 & -cs & c^2 & cs \\ -cs & -s^2 & cs & s^2 \end{bmatrix}$$

$c = \cos\theta \quad and \quad s = \sin\theta$

The Global Stiffness Matrix of a Fixed-Fixed Frame Element

$$K = \begin{bmatrix} a_1 & a_2 & -a_3 & -a_1 & -a_2 & -a_3 \\ & a_4 & a_5 & -a_2 & -a_4 & a_5 \\ & & a_6 & a_3 & -a_5 & a_6/2 \\ & & & a_1 & a_2 & a_3 \\ & & & & a_4 & -a_5 \\ & & & & & a_6 \end{bmatrix}$$

where

$$a_1 = (EA/L)\,c^2 + (12EI/L^3)\,s^2$$
$$a_2 = (EA/L - 12EI/L^3)\,cs$$
$$a_3 = (6EI/L^2)\,s$$
$$a_4 = (EA/L)\,s^2 + (12EI/L^3)\,c^2$$
$$a_5 = (6EI/L^2)\,c$$
$$a_6 = 4EI/L$$

$c = \cos\theta \quad and \quad s = \sin\theta$

For a CST (case of plane Stress)

$\{\varepsilon\}=[B]\{d\}$ $\quad \{\sigma\}=[D]\{\varepsilon\}$

$$[D] = \frac{E}{1-\nu^2}\begin{bmatrix} 1 & \nu & 0 \\ \nu & 1 & 0 \\ 0 & 0 & (1-\nu)/2 \end{bmatrix}$$

$$[B] = \frac{1}{2A}\begin{bmatrix} \beta_1 & 0 & \beta_2 & 0 & \beta_3 & 0 \\ 0 & \gamma_1 & 0 & \gamma_2 & 0 & \gamma_3 \\ \gamma_1 & \beta_1 & \gamma_2 & \beta_2 & \gamma_3 & \beta_3 \end{bmatrix}$$

where $\beta_1 = y_2 - y_3$, $\beta_2 = y_3 - y_1$, $\beta_3 = y_1 - y_2$ and $\gamma_1 = x_3 - x_2$, $\gamma_2 = x_1 - x_3$, $\gamma_3 = x_2 - x_1$

The Global Stiffness Matrix for Fixed-Hinged Frame Element

$$K = \begin{bmatrix} a_1 & a_2 & -a_3 & -a_1 & -a_2 \\ & a_4 & a_5 & -a_2 & a_4 \\ & & a_6 & a_3 & -a_5 \\ & & & a_1 & a_2 \\ & & & & a_4 \end{bmatrix}$$

where

$$a_1 = (EA/L)\,c^2 + (3EI/L^3)\,s^2$$
$$a_2 = (EA/L - 3EI/L^3)\,cs$$
$$a_3 = (3EI/L^2)\,s$$
$$a_4 = (EA/L)\,s^2 + (3EI/L^3)\,c^2$$
$$a_5 = (3EI/L^2)\,c$$
$$a_6 = 3EI/L$$

تصميم منشآت خرسانية مسلحة (٣) إنشاءات (قديم)

TANTA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF STRUCTURAL ENGINEERING

EXAMINATION (4th YEAR) STUDENTS OF STRUCTURAL ENGINEERING

COURSE TITLE: Reinforced Concrete Design III		COURSE CODE: CSE 4137
DATE: 12-1-2011	TERM: FIRST	TOTAL ASSESSMENT MARKS: 70	TIME ALLOWED: 3 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 ٥ أسئلة فى ورقتين

PROBLEM # ONE (20 Marks)

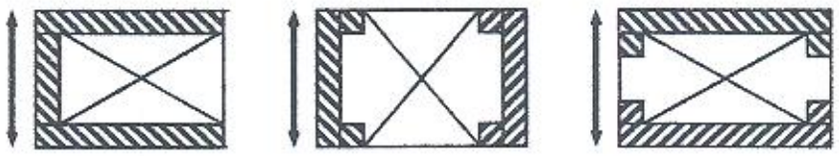
I. For a half spherical R.C dome with 15.0 m diameter and 7.50m rise,
- ***Suggest*** the most adequate structural shape of the supporting ring beam.
- ***Indicate*** the most critical design internal force components (meridian force or ring force) and the effect on reinforcement detailing. **(5 Marks)**

II Shown in Fig. 1 are sectional elevations of four folded plate roof structures. It is required to ***mark*** ridge lines with internal shear. **(5 Marks)**

Fig. 1

III- ***State*** which statement is right and which one is wrong , then ***correct*** the wrong one:
- Prestressing technique can be applied to all RC elements to enhance their structural performance.
- Economically, it is recommended to use post-tensioning technique rather than pre-tensioning. **(5 Marks)**

IV. ***Compare*** among the following core systems in term of lateral load resistance for earthquake action in the specified direction. **(5 Marks)**



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PROBLEM # TWO (15 Marks)

Shown in **Fig. 2** is a sectional elevation of RC folded plates covering an exhibition hall has dimensions of 40x15m. The hall has a clear height of 6.0 m and columns are allowed only on the outer perimeter of the hall.

It is required to carry out the followings:

i. ***Calculate*** the internal forces and ***design*** the critical sections of the folded plates. **(7 Marks)**

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

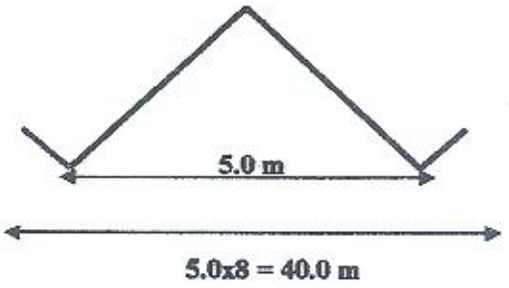


Fig. 2

PROBLEM # THREE (10 Marks)

For the 10-story administrative building, shown in **Fig. 3**, located at earthquake zone 2. the ground floor is 4.0 m hight and the typical floor is 3.0 m height where the columns are arranged at 5.0m spacing. The foundation level is (-2.50 m) with 0.4 m plain concrete mat and 1.*20* m reinforced concrete raft. It is required to ***Give*** complete design and details of reinforcement of the core only. Assume 0.35 m thickness 5.5 x 3.5 m core system under the effect of vertical gravitational load and critical lateral load effect in the specified direction shown in **Fig. 3.** The service axial dead and live loads are 5000 kN and 2000 kN, respectively. The working base shear due to wind and earthquake loads are 210 kN and 260 kN, respectively.(Note that: B.M due to lateral loads can be calculated using approximate methode)

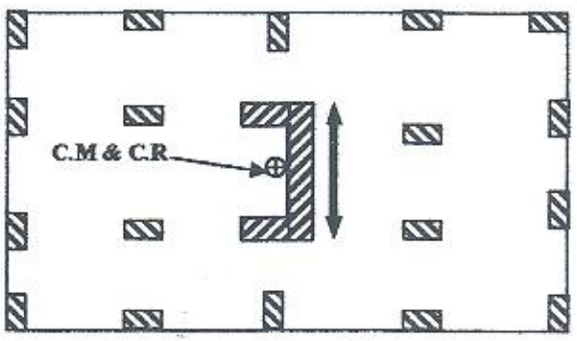
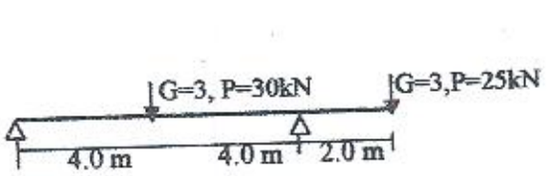


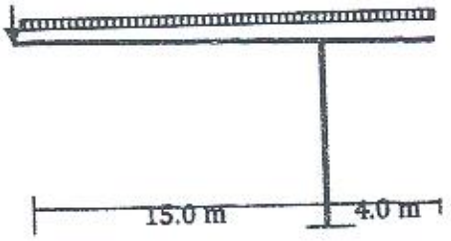
Fig. 3

Please Turn Over ⟶

PROBLEM # FOUR (12 Marks)

I For each of the given cases, indicate wherever pre-tensioning or post-tensioning may be applicable than, draw the proposed cable profile in each case. **(5 Marks)**





II For the shown cross section **(Fig. 4)** of simply supported pre-tensioned pre-stressed concrete beam of 20 m span assuming 12% losses.

Data:

f_{cu} = 45 MPa.

D.L (without o.w) = 7 kN/m'

L.L = 2 kN/m'

Z_T = $92.16*10^6$ mm^3

Z_B = $37.94*10^6$ mm^3

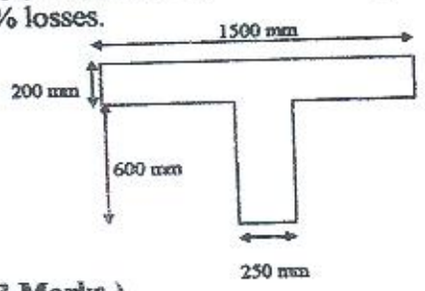


Fig. 4

Required:

- Suggest suitable cable profile. **(3 Marks)**
- Calculate the initial prestressing force P_o (P_i) **(4 Marks)**

PROBLEM # FIVE (13 Marks)

Shown in **Fig. 5** is a sectional elevation of RC dome with 24 m diameter covering an exhibition hall. The hall has a clear height of 10.0 m and columns are allowed only on the outer perimeter of the hall.

It is required to carry out the followings:

I. *Calculate* the internal forces and design the critical sections of the dome. **(7 Marks)**

II. *Draw* to a convenient scale a half elevation and a half plan showing the details of reinforcement of the hall. **(6 Marks)**

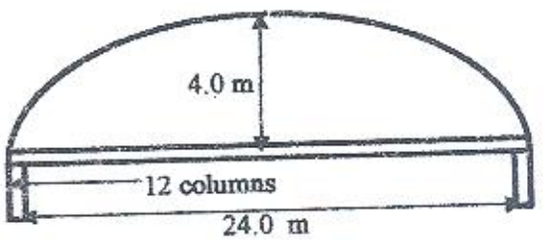


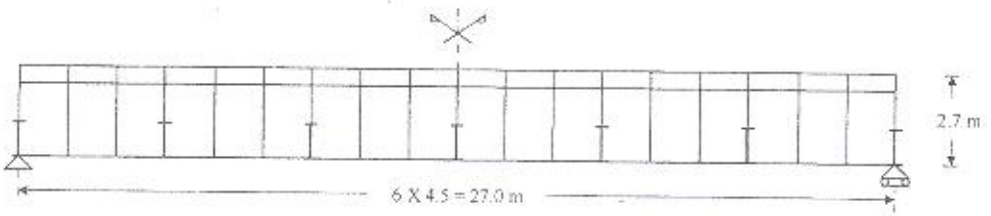
Fig. 5

With best wishes انتهت الاسئلة

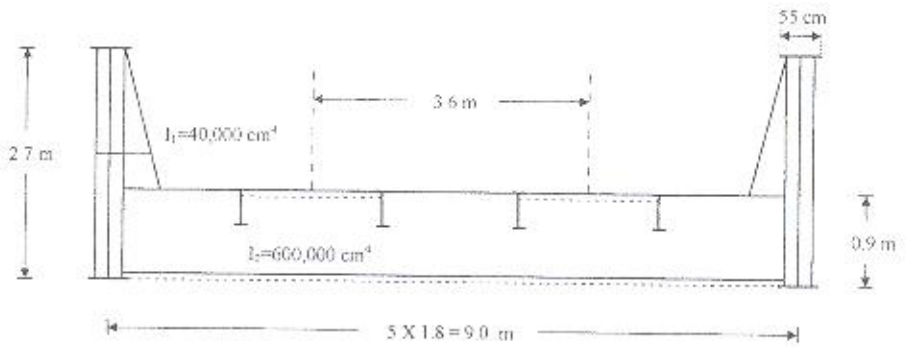
Course Examination Committee:

Prof. Tarek Mohamed Fawzy

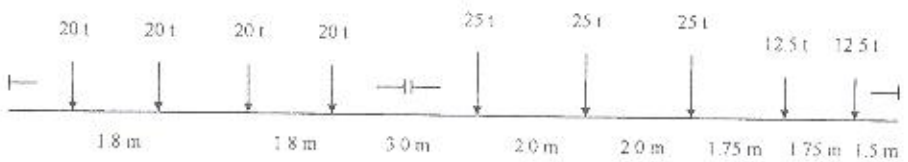
Assoc. Prof. Dr. Mohamed Hussein **Dr. Nesreen Kassem**



Elevation of Main Girder



Cross Section of Bridge



Train Type "D" (Axle Loads)

With Best Wishes

Course Examination Committee

Dr. Mahmoud El-Boghdadi and the Committee

Course Coordinator: Dr. Mahmoud El-Boghdadi

Tanta University

Structural Engineering Department
Total Marks: 70 Marks

Faculty of Engineering

Course Title: Foundations Engineering (2)	Course Code: CS4104	Year: 4th
Date: January 17th 2011 (First term)	Allowed time: 3 hrs (Term Exam)	No. of Pages: (3)

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

Problem number (1) **(12 Marks)**

(a) Explain the different types of sheet pile walls according to its structure system. **(2.0 Marks)**

(b) Show the main information required to design the sheet piling retaining walls. **(2.0 Marks)**

(c) For the anchored sheet pile wall shown in Figure (1) , the allowable stress of steel is 2000 kg/cm^2. You are required to calculate the followings:-

1) The minimum depth of embedment, d, to provide stability. **(4.0 Marks)**
2) The required section modulus of the steel sheet pile. **(4.0 Marks)**

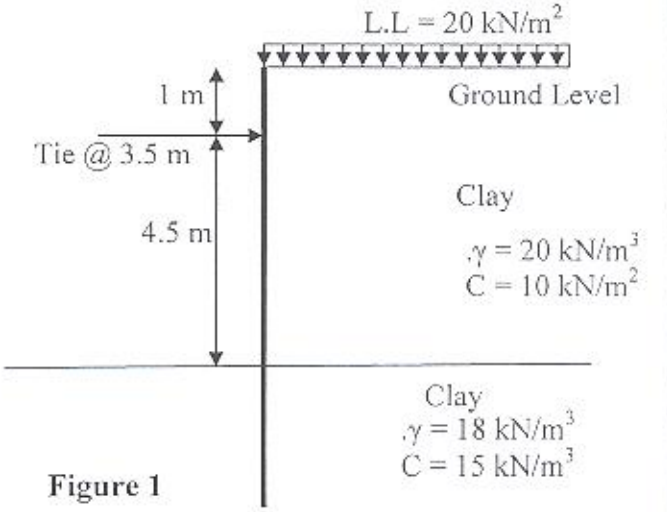


Figure 1

Problem number (2) **(11 Marks)**

(a) Show the different types of braced cuts **(3.0 Marks)**

(b) For the braced excavation shown in the figure design the whole structural elements. **(8.0 Marks)**

For sandy layer
Unit weight = 17.00 kN/m^3
angle of internal friction, ø = 40°
For clayey layer
Unit weight = 20.0 kN/m3
Colesion, C = 150 kN/m2
Live load at surface = 10 kN/m2

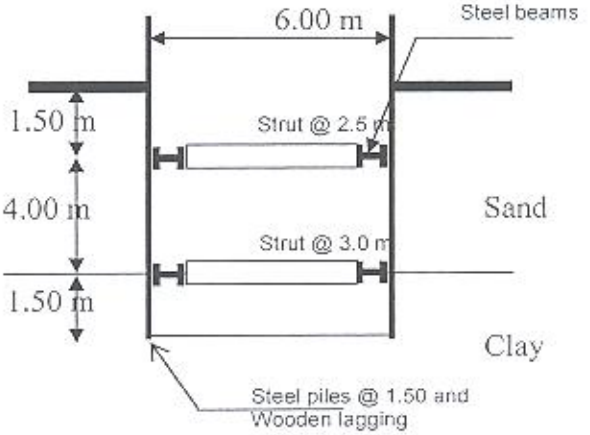
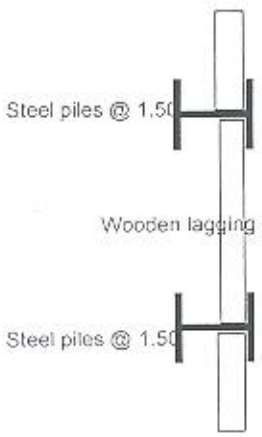


Figure (2)



Section of steel sheet pile

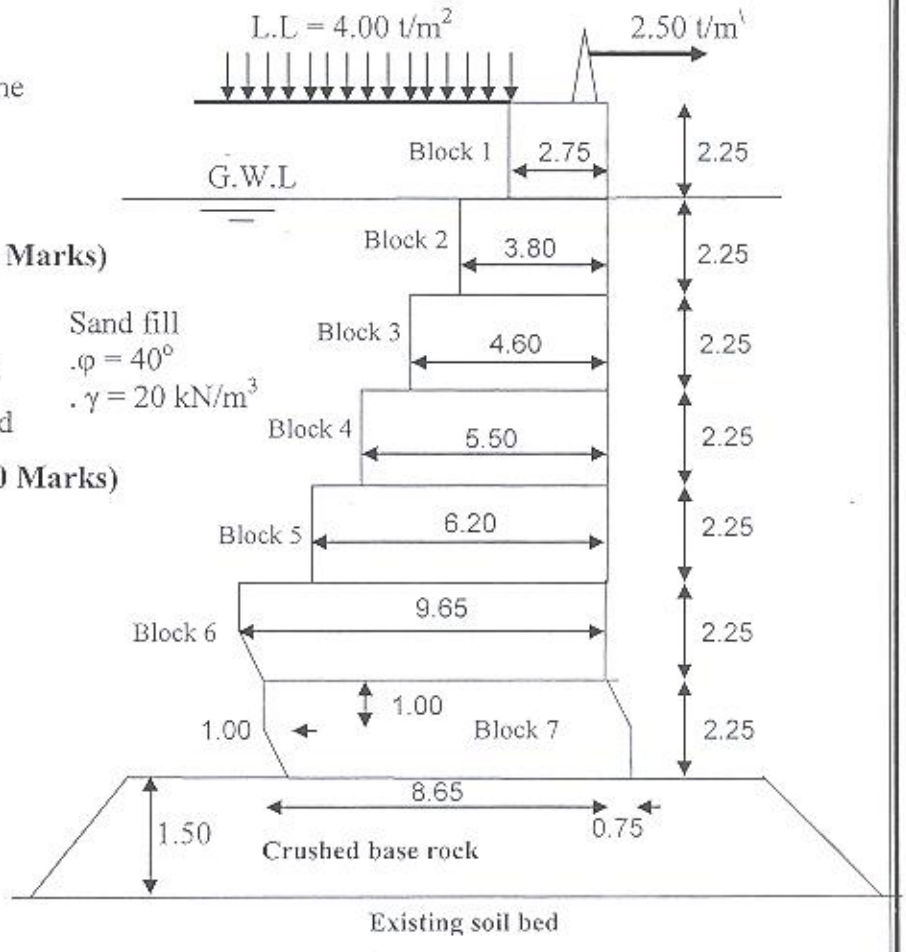
P.T.O.

Problem number (3) **(12.0 Marks)**

(a) State the different types of gravity retaining walls. **(2.0 Marks)**

(b) For the shown gravity wall in the figure, you are required to:

- Check the stability of block # 6 **(5.0 Marks)**
- Calculate the stress underneath Block # 7 and stress transmitted to the existing soil bed **(5.0 Marks)**



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

a) Illustrate the difference between the sectional and plan flow nets. **(1.5 Marks)**

b) Using clear sketches, discuss the factors affecting the discharge capacity of both well point and deep well. **(1.5 Marks)**

c) Explain how to warranty the safety of old building adjacent to excavation site with foundation level is much deeper than that of the old building **(1.5 Marks)**

d) The section of an excavation is rectangular (20 x 30) m in plan and 7.0 m in depth. The site profile consists of 8.0 m medium to stiff clay overlying 4.0 m medium to coarse sand on intact granite bedrock. The initial ground water table is (-2.0 m). The nearest waterway is far away 150 m. The coefficient of permeability for sand layer = 0.002 m/sec. The available wells are 25 cm in diameter and 12.0 m in length with discharge capacity = 0.014 m^3/sec

(i) Design the pressure relief system. **(4.5 Marks)**

(ii) Estimate the drawdown of water at well and midpoint between wells. **(4.0 Marks)**