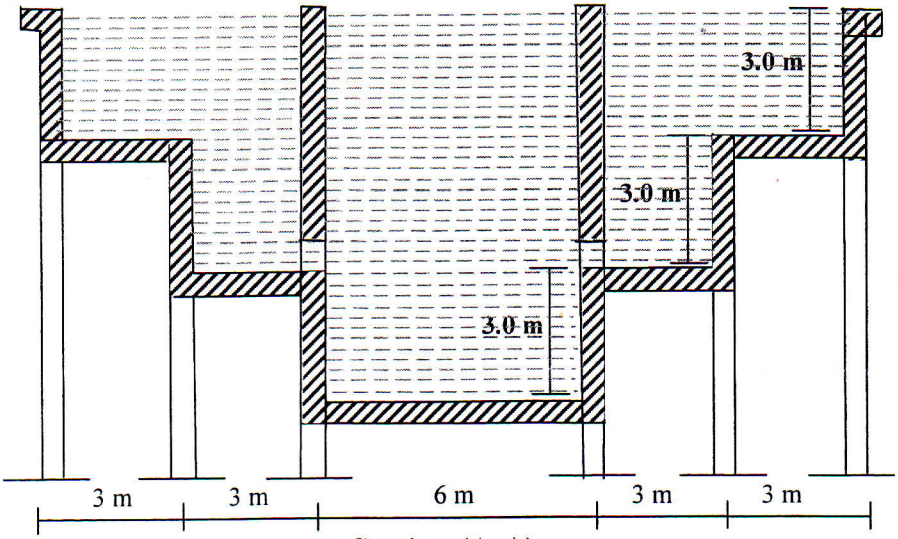
Menoufia University
Faculty of Engineering, Shebin El-Kom
Civil Eng. Department
Date of Exam: 7/ 6 / 2014

Subject: Reinforced Concrete
Code: CVE 411
Year : 4rd Year Civil
Time Allowed : 4 hours

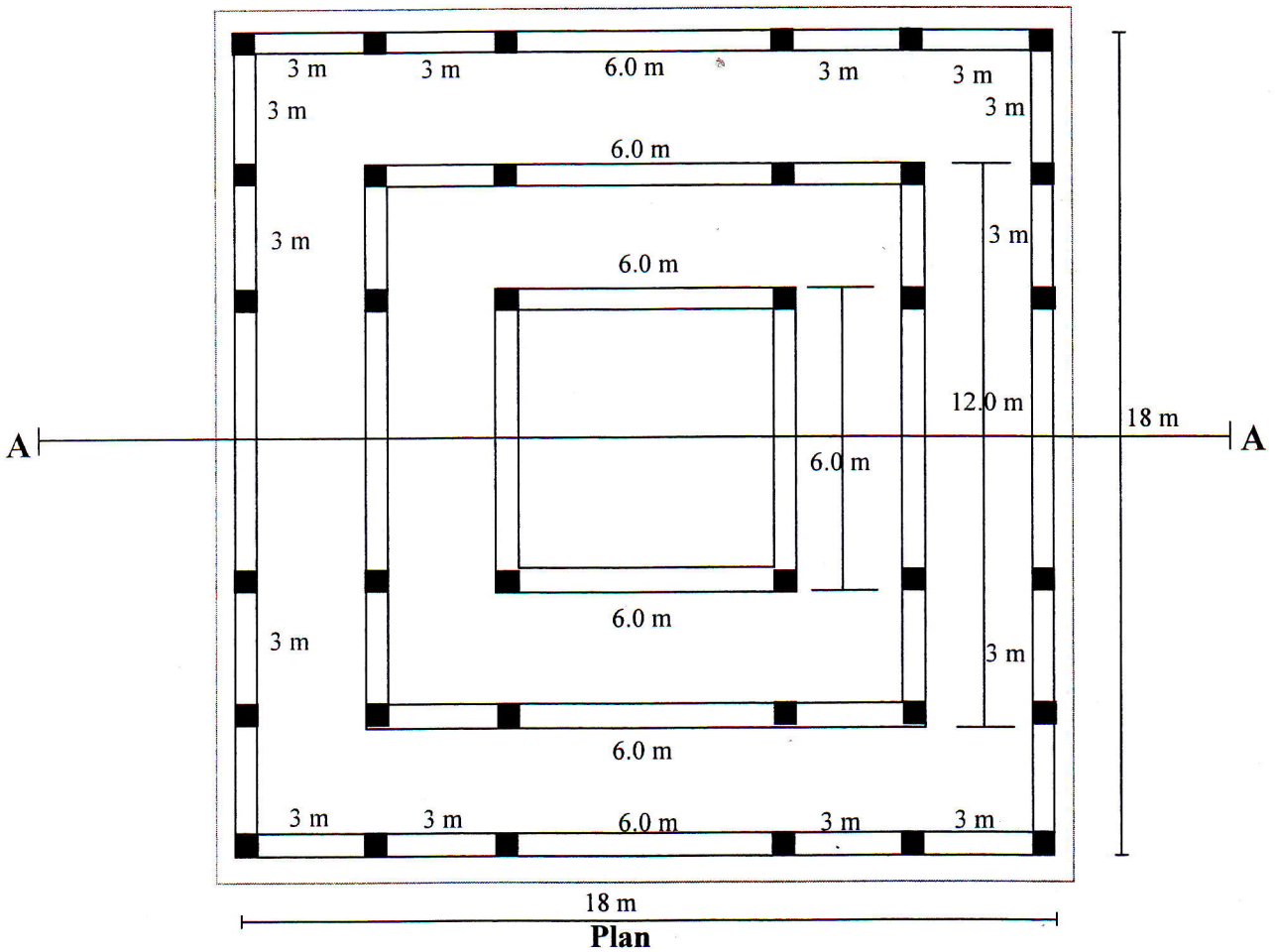
- Systematic arrangement of calculations, neat drawings and clear answers are essential.
- Any data not given can be reasonably assumed. The exam consists of four questions. All of them must be answered. All dimensions in meter.

Question (1) ..... **(45 %)**

For the given, open water RC rectangular tank with outer dimensions 18*18 m and a height of 3.0 m, 6.0 m and 9.0 m respectively as shown in figure (1) the top edge of the RC walls is associated with a horizontal beam as shown in figure (1) it is required to make a Complete design for the given mentioned RC tank shown in figure (1) complete design means, complete calculations, design of critical sections and details of reinforcements. **Given:** $F_{cu} = 25$ N/mm^2, $F_y = 360$ N/mm^2



Section (A-A)



Plan

Figure (1): RC elevated open water rectangular tank

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Question 3 (25%) :

Figure (1) shows a hexagonal reinforced concrete flat slab. Each side = 10 m with cantilevers around it as shown. The slab is supported on 6 corner columns as well as on a central column. The ultimate uniform load w_u=3 t/m^2 and 6 concentrated ultimate loads = 2 t acting at the mid span between columns

(a) Draw the expected yield lines pattern. (5%)

(b) Find the ultimate moments of the slab. (10%)

(c) Design the slab and draw the details of reinforcement. (10%)

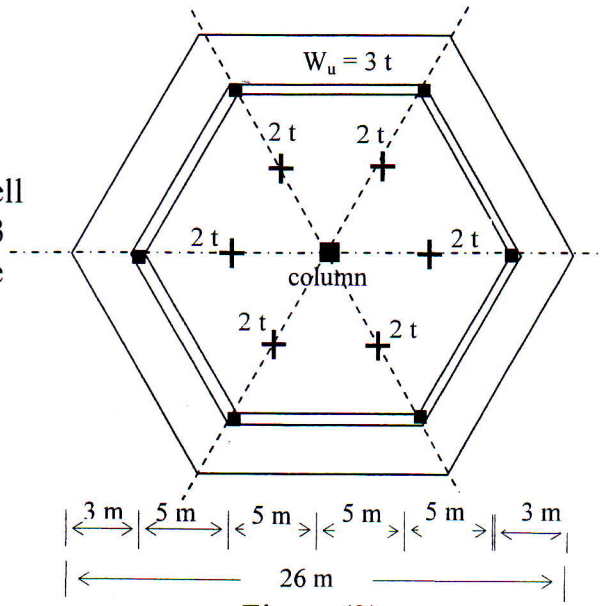

Figure (2)

Question (4) 25%:

Figure (3) shows a typical plan of flat slabs for 5 – story of a hospital 15x 24 m. The reinforced concrete building is in Sharm Elshekh, rested on medium soil. The average total working dead load is 1.5 t/m^2, and live load is 0.5 t/m^2 . Shear walls dimensions are: W_1 , W_2 = 0.3 x 5.0 m and W_3 = 0.3 x 6.0 m. Columns are 60x60 cm. Earthquake forces are resisted by shear walls only.

i. Calculate the max. base shear on the building according to the Egyptian Code 201. (10%)

ii. Calculate the equivalent lateral load on each floor due to earthquake in the shown direction then check overturning of the building. (5%)

iii. Check sliding if the adhesion strength C_a = 5 t/m^2 , and frictional angle between soil and foundation ϕ = 15 ^{o} (5%)

iv. Calculate the center of mass CM and the center of rigidity CR and compute the design forces on walls w_1, w_2. (5%)

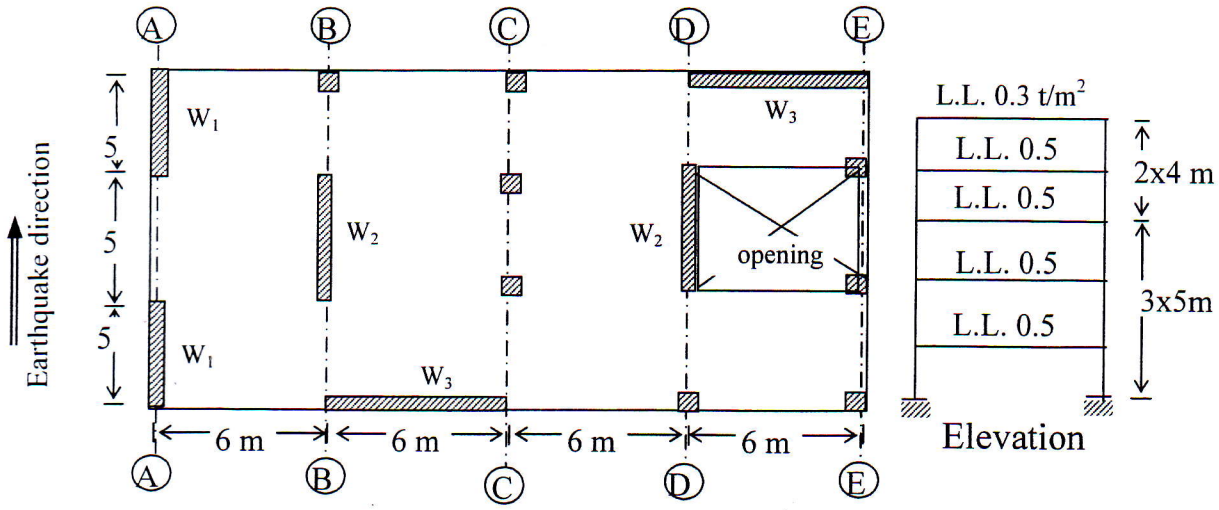

Figure (3): Plan of typical floor

- **Any data not given is to be assumed.**

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