Kaferelshiekh University
Faculty of Engineering
Department of Civil Engineering

Fourth Year Students of Civil Engineering	Course title: Design of Reinforced Concrete structures 3	Course code : CES4122
Date : 30-12-2019	Term : First	Total Assessment Marks : 100	Time Allowed : 4 hours
f_{cu} = 30 MPa, St.360/520	Any missing data should be reasonably assumed. **Answer as many questions as you can.**	الامتحان مكون من سؤالين في صفحتين

Question (1): *(50 marks)*

(A): Answer the following:

1) Illustrate the types of RC tanks with respect to the connection type, base of the tanks and construction methods.
2) What is the concept of the section design in RC tanks?
3) Give an example on shallow, medium and deep tanks.
4) What is the function of the top beam in RC tanks? And why the top beam was preferred in the shallow tank?
5) From structural view, how to classify the soil under the tank weak or strong soil?
6) Illustrate the concept of pre-stressed concrete.
7) Compare between pre-tensioning pre-stressed concrete and post-tensioning pre-stressed concrete.
8) What are the short-term losses of pre-stressed concrete?
9) State the cable types used in pre-stressed concrete process.
10) State the cable types used in pre-stressed concrete process.
11) Draw cable profile of two span beam under an uniform load.

(B) Circular tank

Fig. (1) shows a sectional elevation for a circular tank rested on central support of 2 m diameter. It is required to carry out the following:-

1) Draw the final straining actions on the cylindrical wall and circular plate.

2) Design the critical sections. Consider tensile strength of concrete (f_{ct}) is 1.8 MPa for all types of sections.

3) Draw concrete dimensions and RFT details in plan and sections with suitable scales.

4) If the central support was removed, what will happen in the floor and the wall? Showing difference in straining actions and RFT details with net sketches and without calculations.

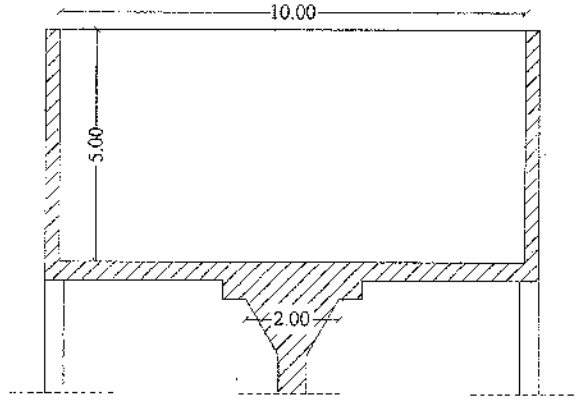

Fig.(1) SEC. ELEV.

(C) Ground tank

Design and draw, without scale, RFT details for a circular tank of 15m diameter rested on rock soil. Consider the tank height is 3 m and bearing capacity of the soil is 190 kN/m^2.
f_{ct} = 1.8 MPa

Question (2): *(50 marks)*

(A) Rectangular tank

Fig. (2) shows structural plan and sectional elevation for a rectangular tank rested on 4 columns. It is required to carry out the following:-

1) Draw the final straining actions on the necessary strips.

2) Design the critical sections. Consider tensile strength of concrete (f_{ct}) is 1.8 MPa for all types of sections.

3) Draw concrete dimensions and RFT details in plan and sections with suitable scales.

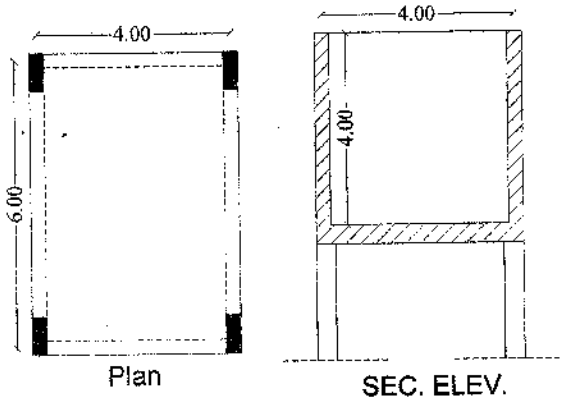

Fig.(2)

(B) RC dome and cone

Fig. (3) shows sectional elevation for covering using RC dome rested on RC cone. It is required to carry out the following:-

1) Draw distribution of internal forces for both dome and cone.

2) Draw concrete dimensions and suggested RFT details in half elevation with suitable scale.

3) Calculate and draw the internal forces on the supporting beams under the cone.

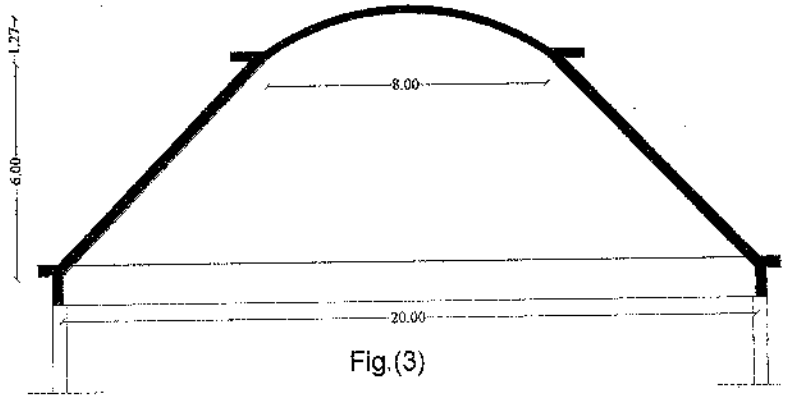

Fig.(3)

(C) Pre-stressed concrete

Figure 4 shows a simply supported pre-stressed concrete with rectangular section of 40 cm in width and 120 cm in height. The post-tensioned using twelve 12.7 mm diameter was applied at the same time. The total jacking tension is 160 ton. The Jack slip is 2.96 mm at anchorage.

$E_c = 3*10^5$ kg/cm^2 $E_p = 2*10^6$ kg/cm^2 $f_c = 400$ kg/cm^2 L.L = 6000 kg/m\

D.L not including o.w = 2000 kg/m\ $f_{py} = 16$ t/cm^2 $\phi = 1.6$

It is required to carry out the following:-

1) Find all losses of pre-stressed cables until five years.
2) If the losses were assumed 20%, find final stresses for critical sections at all stages.
3) Find the net deflection at mid span section in cm.

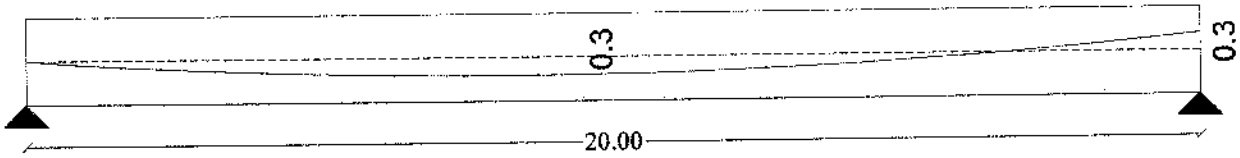

Fig.(4)

With best wishes Dr: Sabry El-Morsy