Kafr El-sheikh University	***2015-2016***	*Fourth Year*
Faculty of Engineering	***Max. Degree: 100***	*Reinforced concrete Structures 3*
Civil Engineering Department		*First Semester*
Final Term Exam	*الإمتحان ورقتان*	*Time allowed: 4 Hours*

- *Any missing data may be reasonably assumed.*
- *Concrete characteristic strength for all reinforced concrete members, f_{cu} = 25 N/mm^2.*
- *Grade of reinforcing steel is 360/520 for main steel.*

Question (1) (25 marks)

a) ***Differentiate*** *in a tabulated form between:*
- *Prestressed concrete and conventional concrete.*
- *Devices used in pre-tension and in post-tension.*
- *Losses in pre-tension and in post-tension.*

b) Although prestressing has several advantages, it can not be used for all RC elements. ***Discuss***

c) The ***prestressed beam*** *shown in Fig. (1) has a rectangular cross section 0.35 x 1.10 m with initial prestressing force P_i = 900 kN and eccentricity e = 0.5 m. Losses may be assumed 12%.*

It is required to carry out the following:

1. *Draw the straining actions due to prestressing only.*
2. *Calculate the equivalent loads due to prestressing.*
3. *Calculate the deflection due to prestressing only at mid-span section of the beam.*
4. *Calculate the stresses at mid-span section due to prestressing only for the transfer and service stages.*

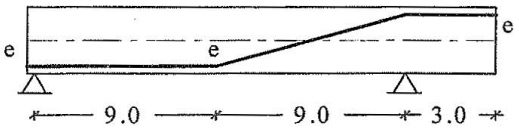

Fig. 1

d) Fig. (2) shows the cross section of simply supported full prestressing girder of 20.0 m span with the given working loads. It is required to make complete design for the critical section of the shown girder.

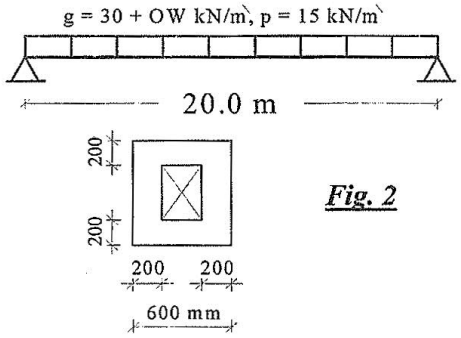

Fig. 2

Question (2) (50 marks)

a) For a spherical ***dome*** *subjected to a live load (P), the angle at which ring forces turn its value from compression to tension is 45^0. Prove*

b) Prove that the meridian and the ring forces are independent for ***conical*** *shell.*

c) For the shown area in Fig. (3-a) of an exhibition hall, columns are allowed only on the outer perimeter of each hall. The circular hall "A" has a clear height of 8.0 m. The 15.0 x 48.0 m long wing denoted "B" has a clear height of 6.0 m. The proposed covering systems for both halls are as follows:

- **Hall "A"**: *Spherical Dome of diameter 25.0 m (Fig. 3-b).*
- **Hall "B"**: *Folded plate roof (Fig. 3-c).*

It is required to carry out the followings:

For Hall "A":

1. *Calculate the internal forces of the upper* ***cone.***
2. *Calculate the internal forces and design the critical sections of the lower* ***dome*** *only.*
3. *Calculate the straining actions of the supporting beams of the lower* ***dome*** *only.*
4. *Draw to a convenient scale a half elevation and a half plan showing the details of reinforcement of the lower* ***dome*** *only.*

For Hall "B":

1. *Make a complete design for the covering system.*
2. *Draw neat sketches for the reinforcement detailing in plan and cross section.*

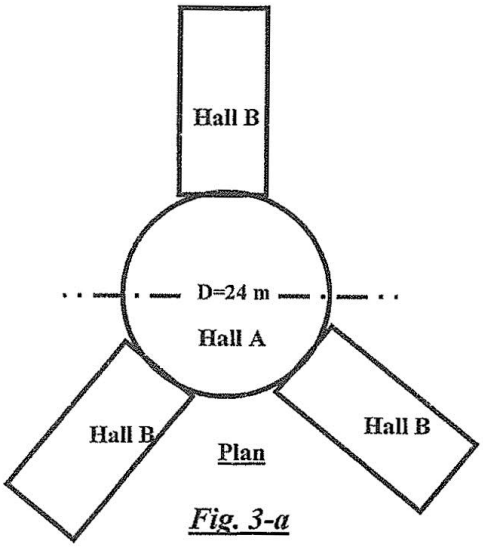

Fig. 3-a

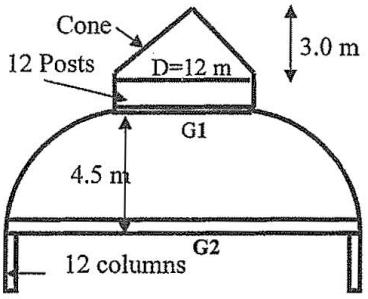

Fig. 3-b

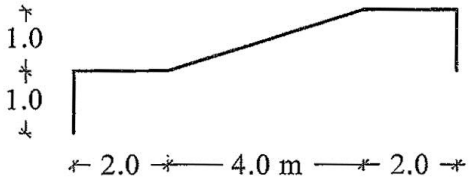

Fig. 3-c

Question (3) (25 marks)

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

1. *Carry out complete design of the tank elements(walls and floor)*
2. *Give full reinforcement details for the tank in plan and cross sections.*

b) *For the elevated **circular** water tank supported on columns as shown in Fig.(5), it is required to:*

1. *Carry out complete design of the tank elements(walls and floor)*
2. *Give full reinforcement details for the tank in plan and cross sections.*

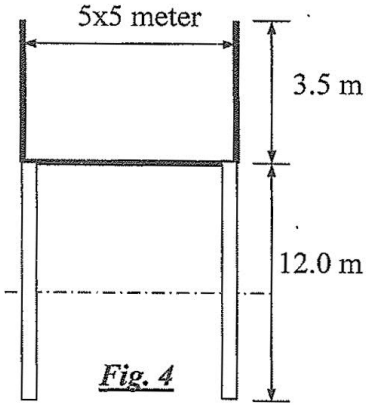

Fig. 4

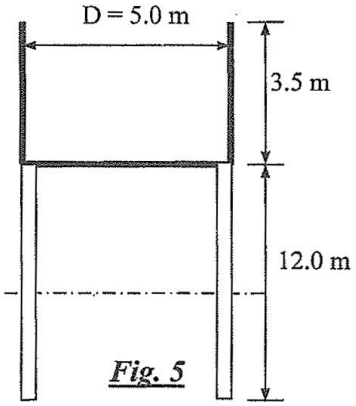

Fig. 5