مادة:تصميم منشآت خرسانية-ب

إمتحان الفصل الدراسي الثاني
ثالثة مدني عام

٢٠١٦-٢٠١٧

دكتور المادة
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د/ أحمد صلاح

BENHA UNIVERSITY
SHOUBRA FACULTY OF ENGINEERING
CIVIL ENGINEERING DEPARTEMENT
Third Year Civil (General)
Code: CVG323

Final Term Exam
Reinforced Concrete Structures (2-B)

مادة:تصميم منشآت خرسانية ـب

الحل النموذجي لإمتحان الفصل الدراسي الثاني

ثالثة مدني عام

٢٠١٦ـ٢٠١٧

دكتور المادة

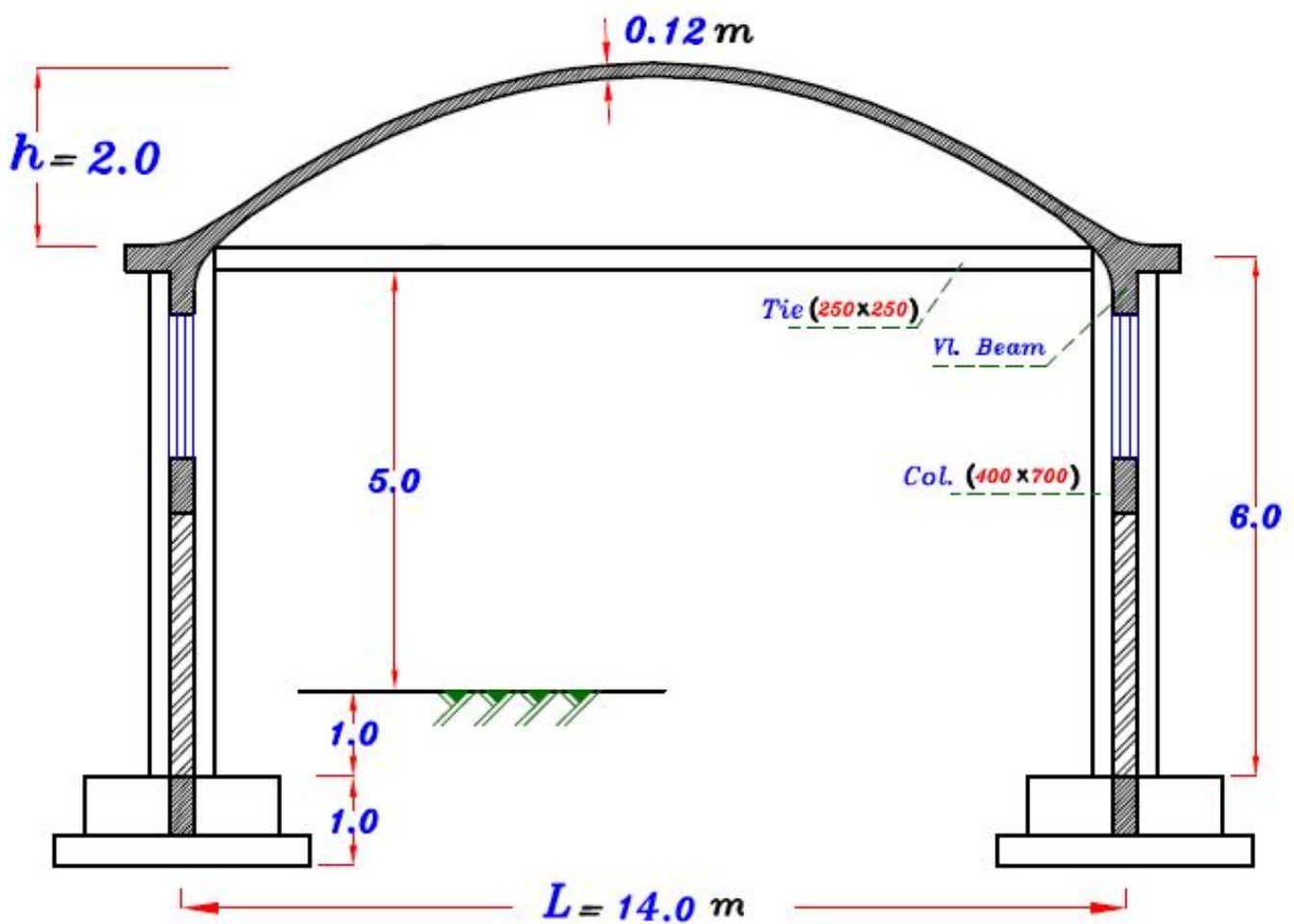# أ.م.د/ محمد سعيد

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BENHA UNIVERSITY
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Final Term Exam
Wednesday 24/05/2017
Reinforced Concrete Structures (2-B)
Duration: 3.0 hours
No. of questions: 2

Model Answer

Question (2): Define the following: **(10 Marks)**   **[ILO's: a1, b1, c1, c2]**

   (a)

Design the Arch Slab.

Take $t_s = 120 \, mm$

$(w_s)_{U.L.} = 1.4 \, (t_s \, \delta_c + F.C.) + 1.6 \, (L.L.)$

$(w_s)_{U.L.} = 1.4 \, (0.12 * 25 + 0.50) + 1.6 \, (1.0)$

$\qquad = 6.50 \, kN\backslash m^2 \quad (H.P.)$

$w_s = 6.50 \, kN\backslash m`$
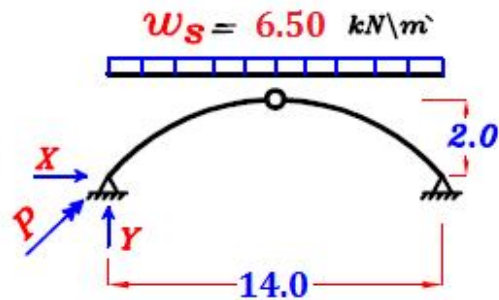
To Get N.F.

$Y = \dfrac{w\,L}{2} = \dfrac{6.50 * 12}{2} = 39.0 \, kN\backslash m$

$X = \dfrac{w\,L^2}{8\,h} = \dfrac{6.50 * 12^2}{8 * 2.0} = 58.5 \, kN\backslash m$

$P = \sqrt{X^2 + Y^2} = \sqrt{39.0^2 + 58.5^2} = 70.30 \, kN$

✱ Design the Arch Slab.

Neglect B.M. & Design on N.F. only.

∴ Designed as a Column.
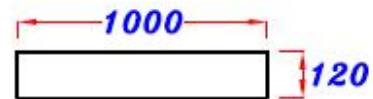
∴ $P_{U.L.} = 0.35 \, A_c \, F_{cu} + 0.67 \, A_s \, F_y$

Take $A_c = 120 * 1000 = 120000 \, mm^2$

∴ $70.30 * 10^3 = 0.35 \, (120000)(30) + 0.67 \, A_s \, (360)$

∴ $A_s = - 4932 \, mm^2 = - (Ve) \, Value$

∴ Take $A_s = A_{s\,min.} = \dfrac{0.8}{100} * b * t$

∴ $A_s = \dfrac{0.8}{100} * 120 * 1000 = 960 \, mm^2 = A_{s\,total}$

∴ Upper Steel & Lower Steel $= \dfrac{A_{s\,total}}{2} = \dfrac{960}{2} = 480 \, mm^2$

$\boxed{5\,\phi\,12\backslash m`}$

1000

120

5 φ 12 \ m`

5 φ 12 \ m`

5 φ 10 \ m`

2

(b)
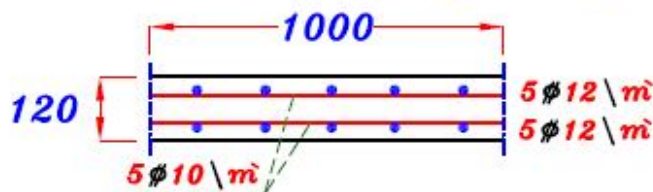
Reinforcement of Arch Slab.

5 φ10\m`

5 φ12\m`

10 φ12

Sec. (1-1)

0.25
0.25

Sec. (2-2)

4 φ16   2 φ12   2 φ12   4 φ16

0.7

0.4

Sec. at the Column.

5 φ16
5 φ18
2 φ16
2 φ18

0.25
0.70
0.25
0.60

t1.4st

Sec. at the Mid Span.

2 φ10
2 φ10
4 φ16
4 φ18

0.25
0.70
0.25
0.60

3
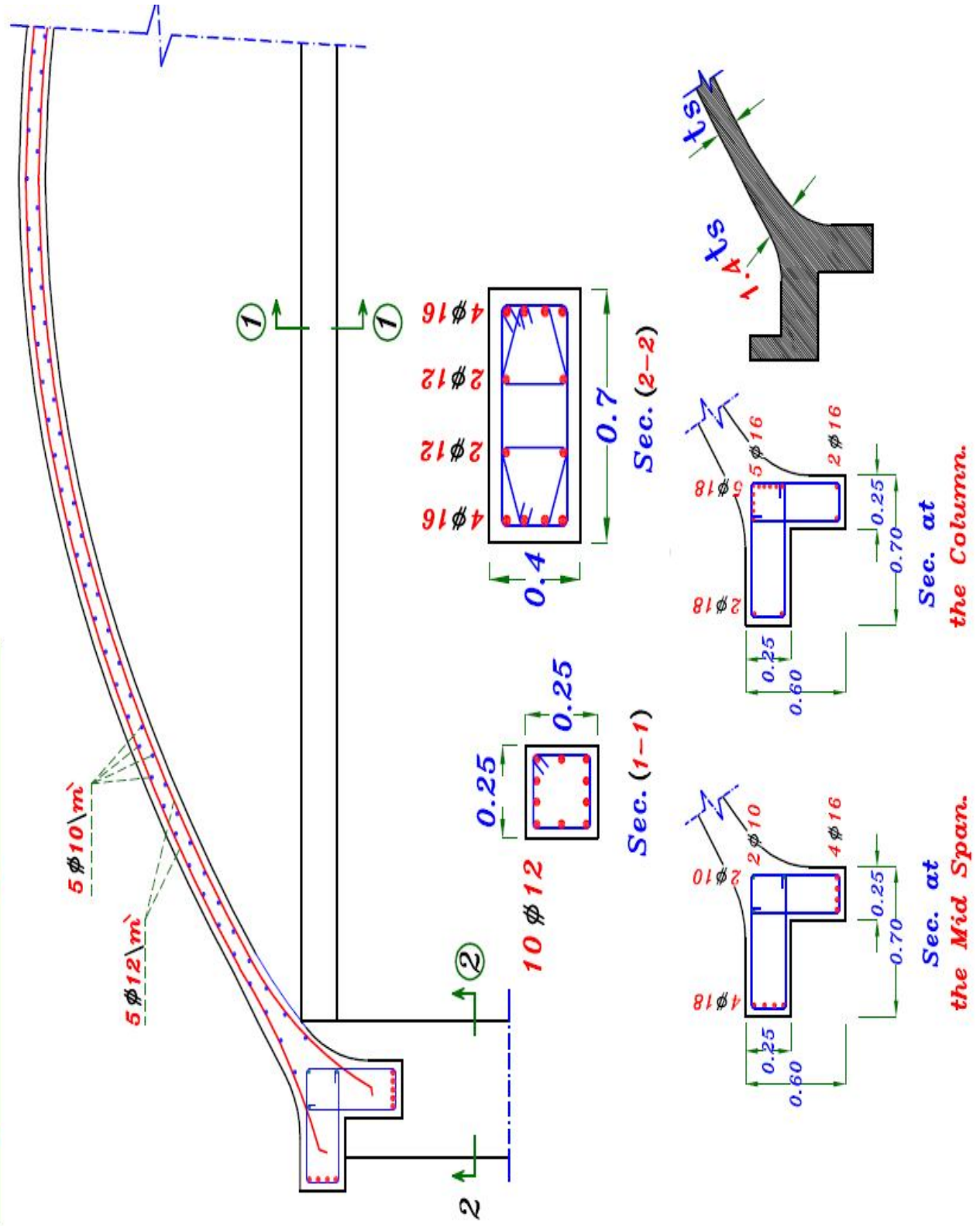
Question (3): Define the following: **(10 Marks)**   **[ILO's: a1, b1, c1, c2]**

(a)

Hanger **(250x250)**

1.30

5.0

3.0 3.0

Tie **(300x300)**

30.0 m

0.6 → 1.0

Figure (3)

2.20

5.0
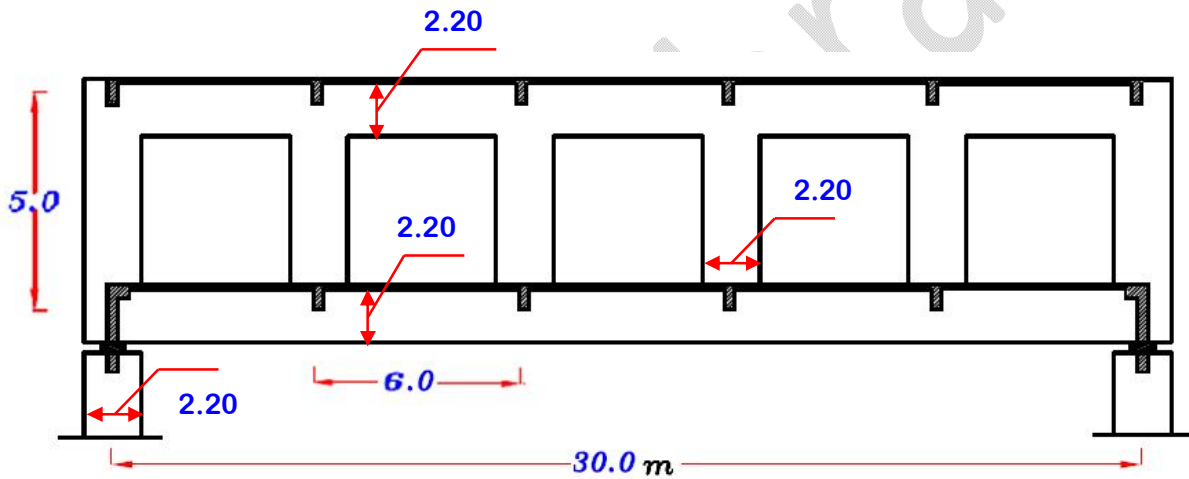
2.20

2.20

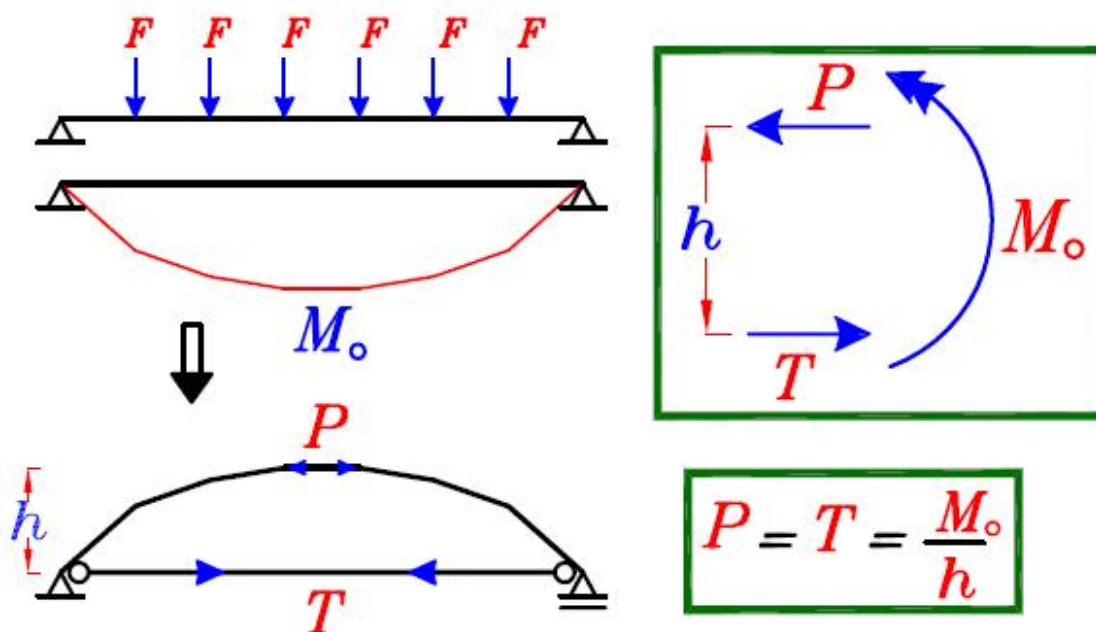6.0

2.20

30.0 m
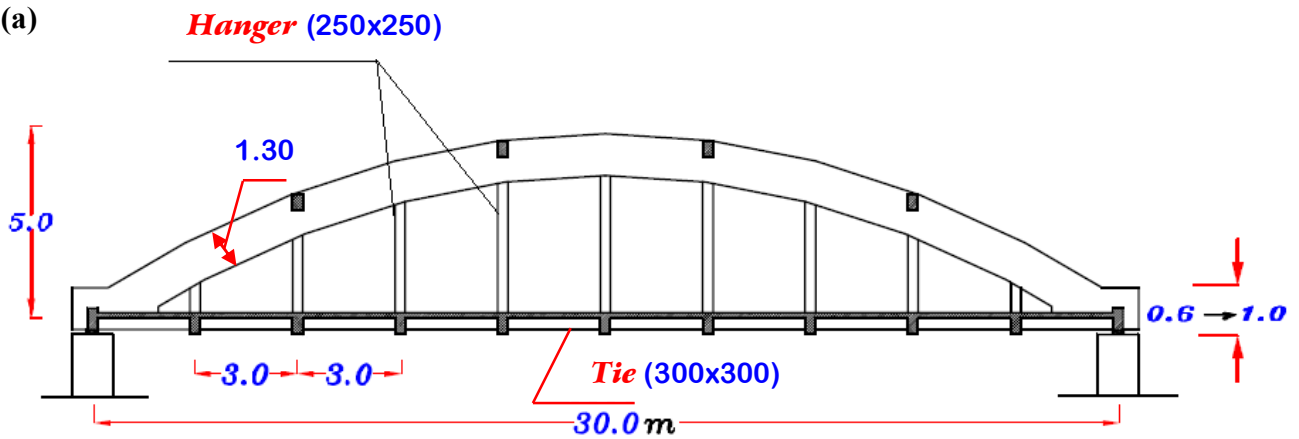
Figure (4)

(b)

Arched Frame System:

Adv : no tension forces

disadv : when arch radius increases, tension increases making it weaker.

Arch Girder Applications.

$$P = T = \frac{M_\circ}{h}$$

تعتمد فكره الـ Arch Girder على تحويل الـ Bending moment الى Couple اى الى Compression Normal Forces & Tension Normal Forces و ذلك للتوفير لانه عند تصميم قطاع عليه pure Compression ستكون كميه الخرسانه و الحديد قليله مما يعمل على تقليل ثمن الـ member

و عند تصميم قطاع عليه pure Tension تكون كميه الحديد كبيره و كميه الخرسانه قليله و تكون ايضا نسبيا ثمن الـ member أقل .

B.M.D.

اذا حدثت استطاله بسيطه للـ Tie سيحدث moment بسيط قيمته فى حدود $0.05\,M_\circ$ اذا قيمه الـ moment الذى سيتحول لـ couple يساوى تقريبا $0.95\,M_\circ$

$$P = 0.95\ \frac{M_\circ}{h}$$

$$T = 0.95\ \frac{M_\circ}{h}$$
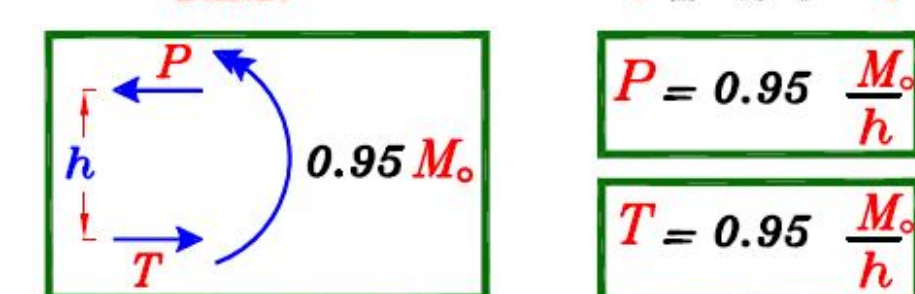
Vierendeel Girder:

Adv & disadv :

The Vierendeel girder design is sometimes adopted in the design of footbridges. In traditional truss design, triangular shape of truss is normally used because the shape cannot be changed without altering the length of its members. By applying loads only to the joints of trusses, the members of truss are only subjected to a uniform tensile or compressive stress across their cross sections because their lines of action pass through a common hinged joint.
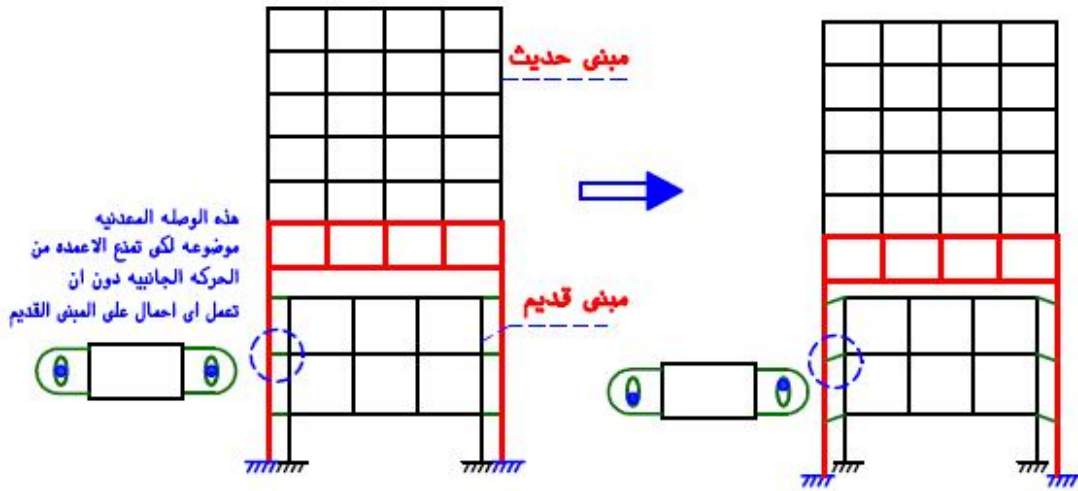
The Vierendeel truss/girder is characterized by having only vertical members between the top and bottom chords and is a statically indeterminate structure. Hence, bending, shear and axial capacity of these members contribute to the resistance to external loads. The use of this girder enables the footbridge to span larger distances and present an attractive outlook. However, it suffers from the drawback that the distribution of stresses is more complicated than normal truss structures

Vierendeel Applications.

أهم إستخدامات الـ Vierendeels

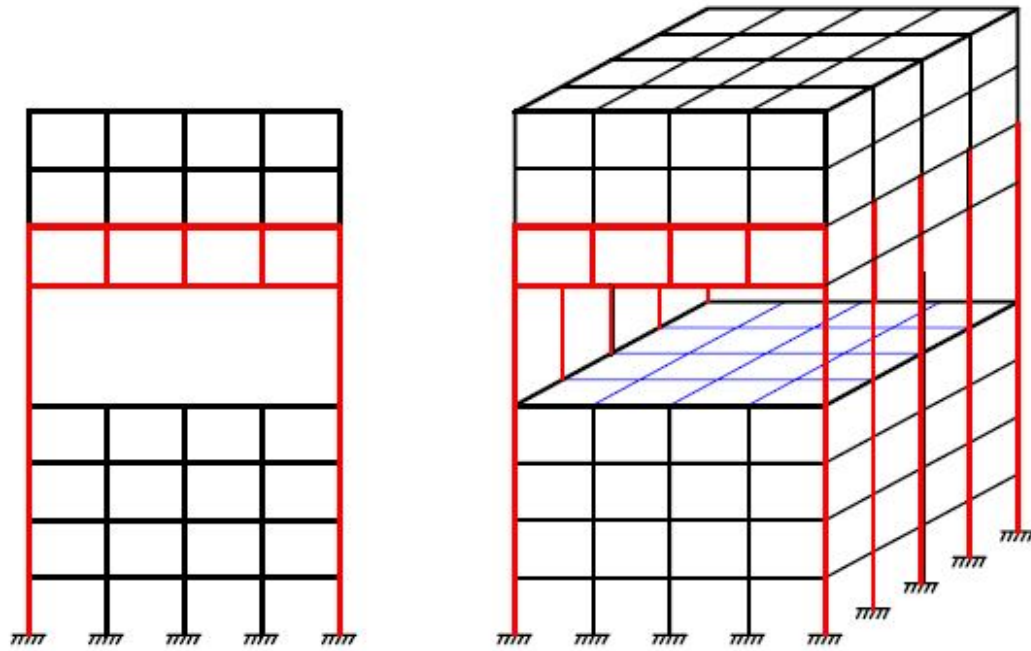يتميز الـ Vierendeels أنه يستطيع أن يحمل عدد من أدوار المبنى فوقه دون وضع أعمده فى المنتصف .

المبنى الحديث محمول على Vierendeels

و الـVierendeels محموله على أعمده خارجيه دون أن يحمل على المبنى القديم

هذه الوصله المعدنيه موضوعه لكى تمنع الاعمده من الحركه الجانبيه دون ان تعمل اى احمال على المبنى القديم

مبنى حديث

مبنى قديم

لا توجد أعمده فى الدور الارضى لان كل الادوارالعلويه محموله على Vierendeels

و الـ Vierendeels محموله على أعمده خارجيه فقط.
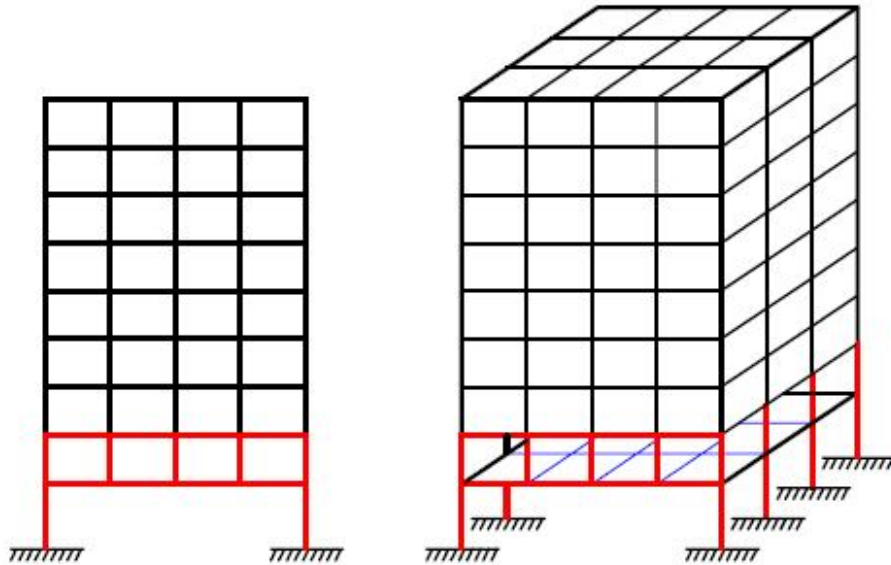
توجد قاعه بدون أعمده داخليه فى الدور الخامس

و الادوار العلويه محموله على *Vierendeels* فى الدور الخامس و ال *Vierendeels* محموله على أعمده خارجيه .

Benha University
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2ⁿᵈ Term Exam
Date: 24/05/ 2017
Reinforced Concrete
Structures (2-B)
Duration : 3 hours

* Design aids and Tables are allowed
- Answer all the following questions
- Illustrate your answers with sketches when necessary.
- The Exam. consists of **two** pages

- No. of questions: 3
- Total Mark: **90 Marks**

(Note: f_y = 360 N/mm², f_y (stirrups) = 240 N/mm², f_{cu} = 30 N/mm²).
 (Any missing data should be reasonably assumed)

Question 1: (ILos a1,b1,c1,c2)

Figure 1 shows a typical section for an storage buidling. The roof slabs are subjected to a uniformly distributed live load of 2.0 kN/m² and floor cover load of 2.0 kN/m². The frame elements width is restricted to be 0.40 m. Spacing between frames equal to 6.0 m. It is required to:

a)- Choose a structural system for the roof slabs on the frames then make complete
   design for the slabs and beams. **(10 Marks)**
b)- Draw to reasonable scale the reinforcement of **roof slabs.** **(10 Marks)**
c)- Make a complete structural analysis of the **frame** and draw the **N.F.D, S.F.D** and
   B.M.D; (The horizontal reaction at support of each frame equal to **18%** of the ultimate
   vertica reaction at this support) **(10 Marks)**
d)- Design all the frame elements according the requirement of the Egyptian Code of
   Practice (ECP203-2007). Detailed calculations are **essential**. **(15 Marks)**
e)- Draw to a reasonable scale the concrete dimensions and complete reinforcement
   details of the frame (1:25) as well as the necessary cross section details(1:10). **(20 Marks)**
 f)- Design the hinged connection (A) then draw the connection details **(5 Marks)**

Figure 1

Benha University
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2nd Term Exam
Date: 24/05/ 2017
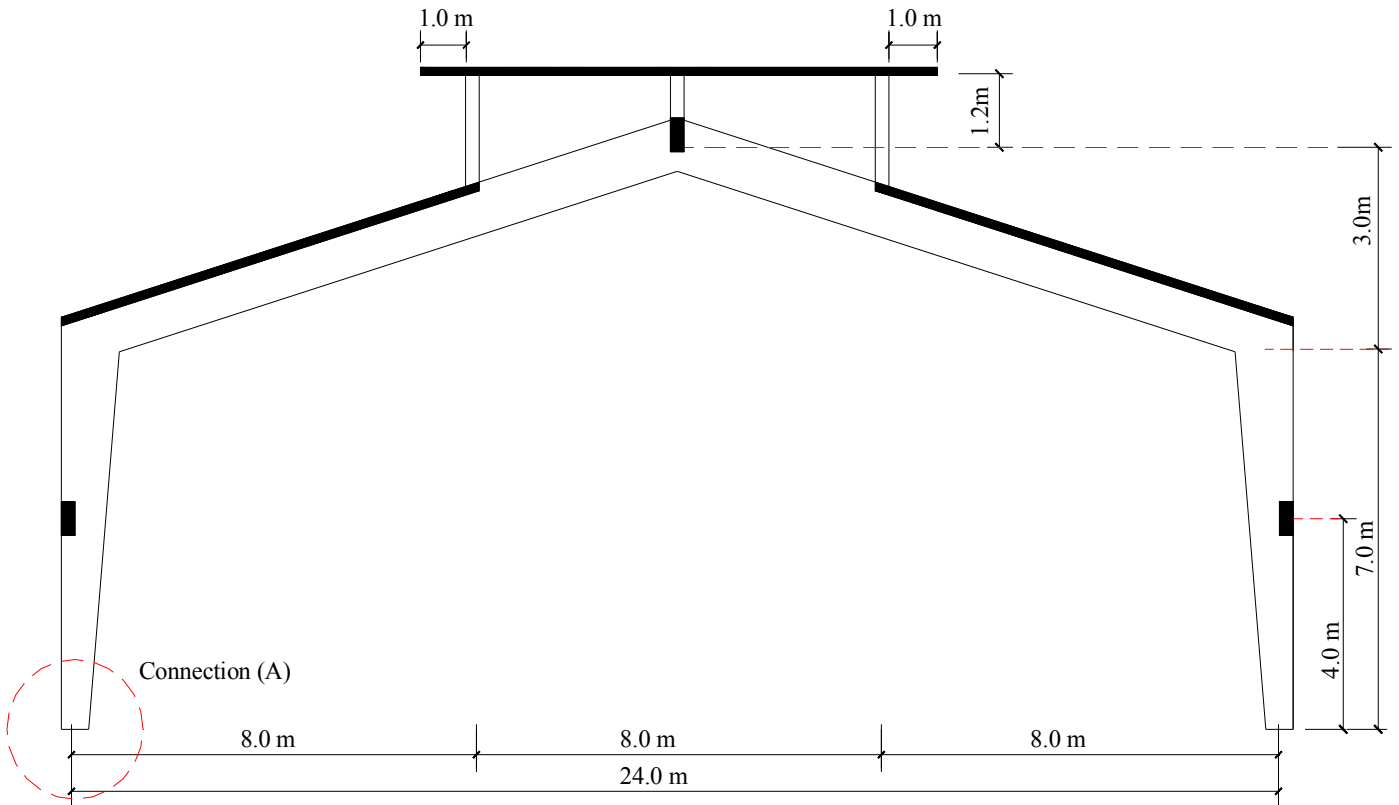**Reinforced Concrete**
Structures (2-B)
Duration : 3 hours

Question 2: (ILos a1,b1,c1,c2)

The arched slab with tie shown in Figure 2 is subjected to live load of 1.0 kN/m^2 and floor cover of 0.5 kN/m^2 . It is required to:
a) Make a complete analysis and Design for the arched slab only.   **(5 Marks)**
b) Sketch to a reasonable scale concrete dimension & reinforcement details for all concrete elements.
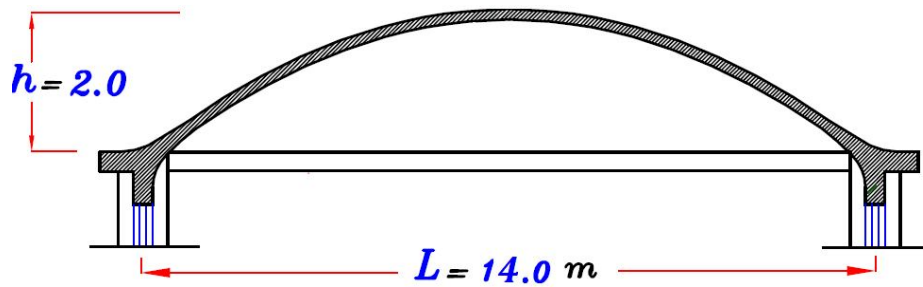   **(5 Marks)**

Figure 2

Question 3: (ILos a1,b1,c1,c2)

-Estimate the concrete dimension **only** for both systems shown in Figure (3) & Figure (4).
-From structural point of view, what the main advantages and disadvantages of each system?
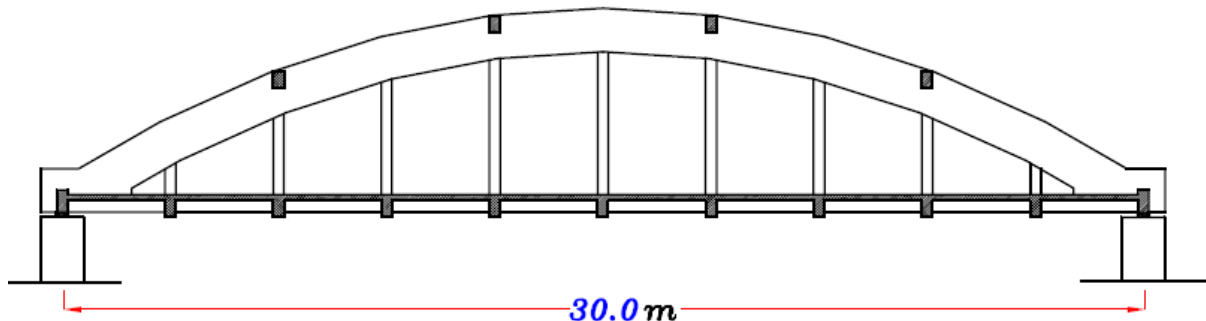Then, list the kind of buildings that can be constructed using each system.   **(10 Marks)**
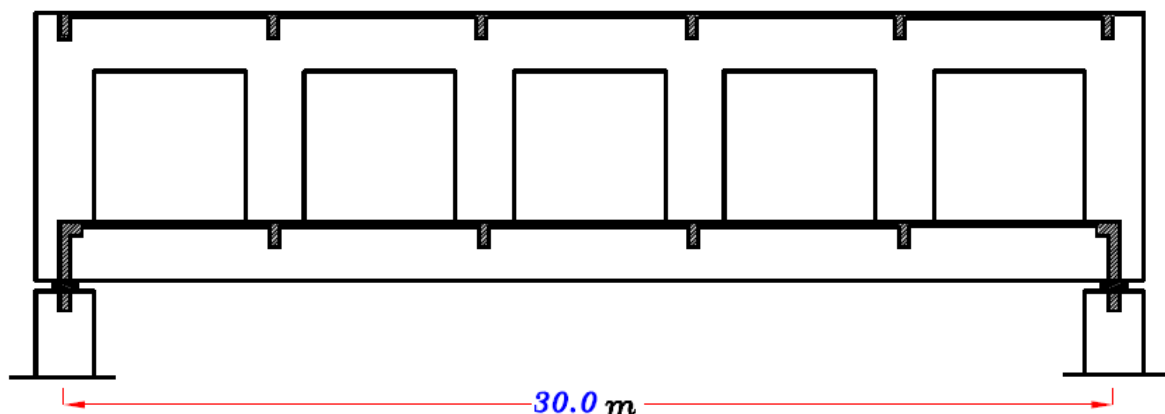

Figure 3

Figure 4