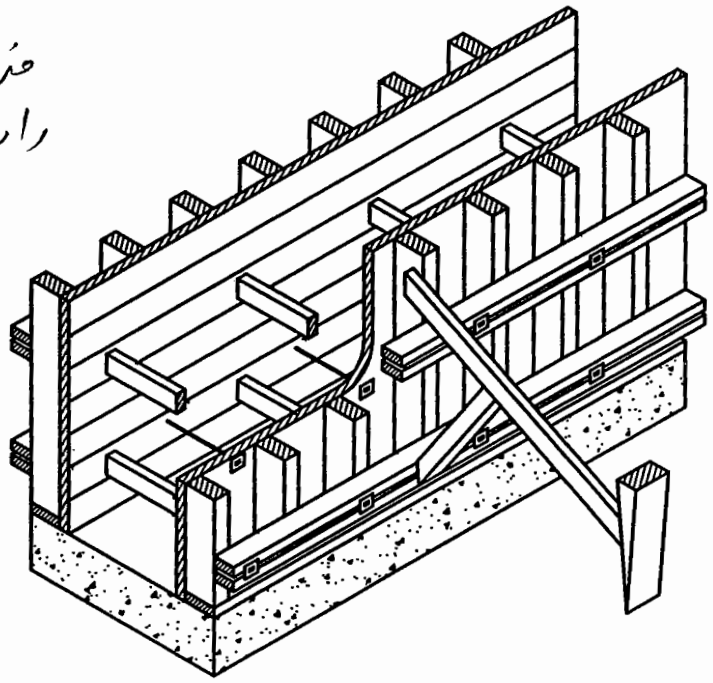
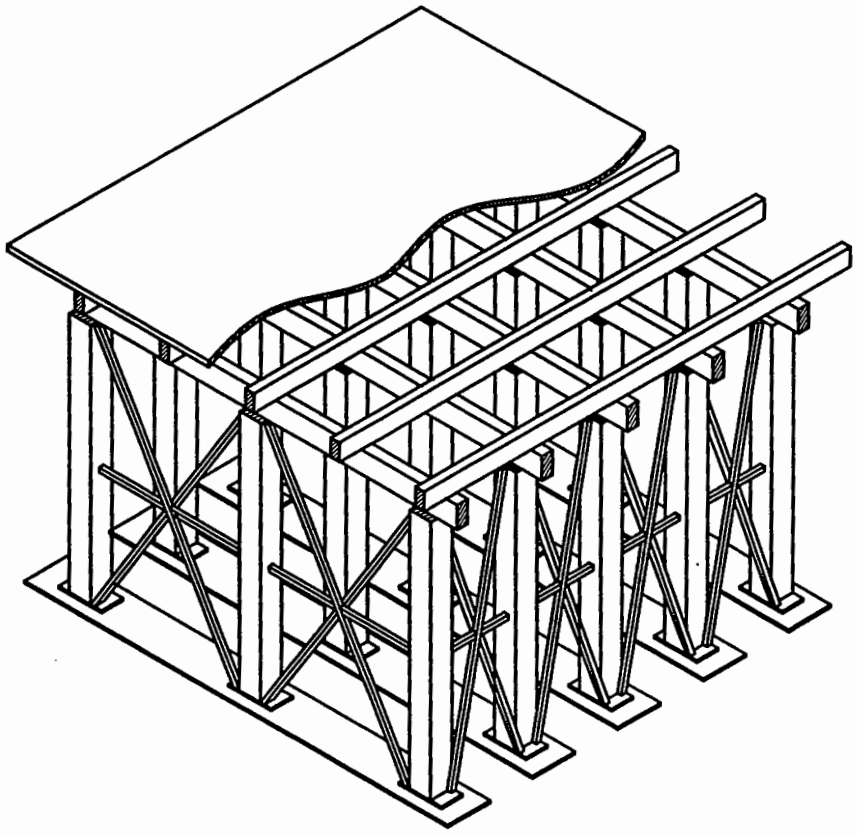
مدرم وشدات
رابعه انشارات
۵



EXAMS



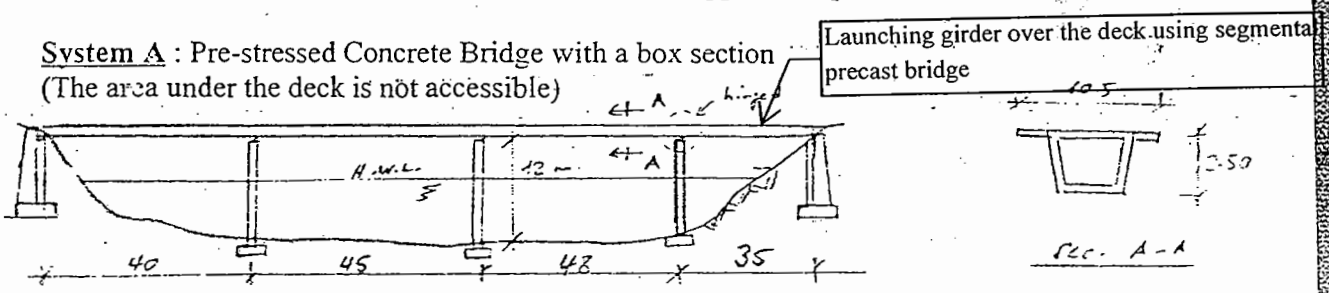
Ain Shams University
Faculty of Engineering
3rd Year Structural Division — Construction Technique of Bridges

Assignment (2)

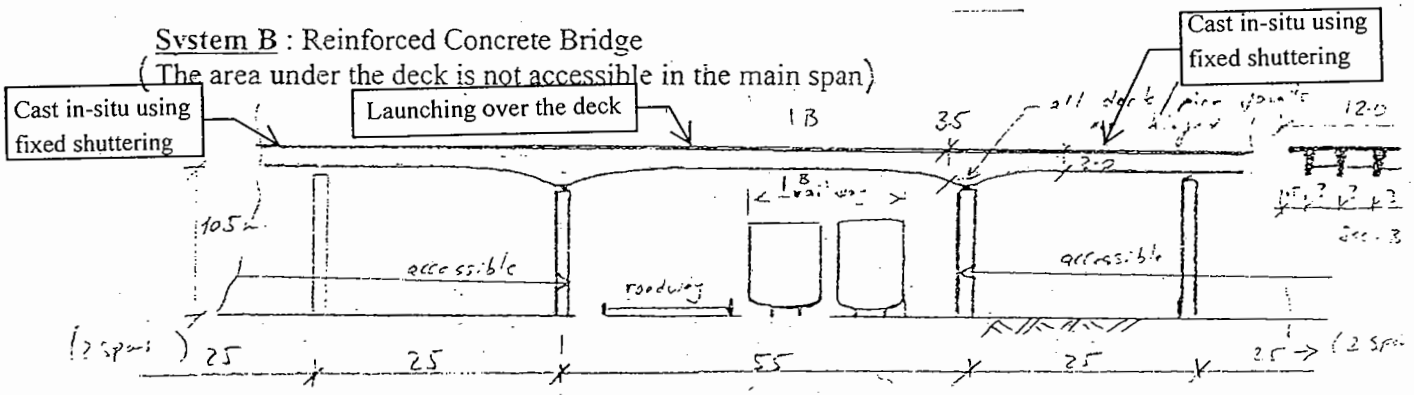
Question 1

For the following bridge systems, it is required to state which construction technique is the reasonable one for the construction of each bridge deck under consideration of the given conditions and why. And then describe with qualitative sketches the main construction phases and show with systematic diagrams the main internal forces (e.g. B.M.D) in both structural elements of construction equipments and in the bridge deck (if available) during the construction. **Note : Differentiae between main and approach spans**

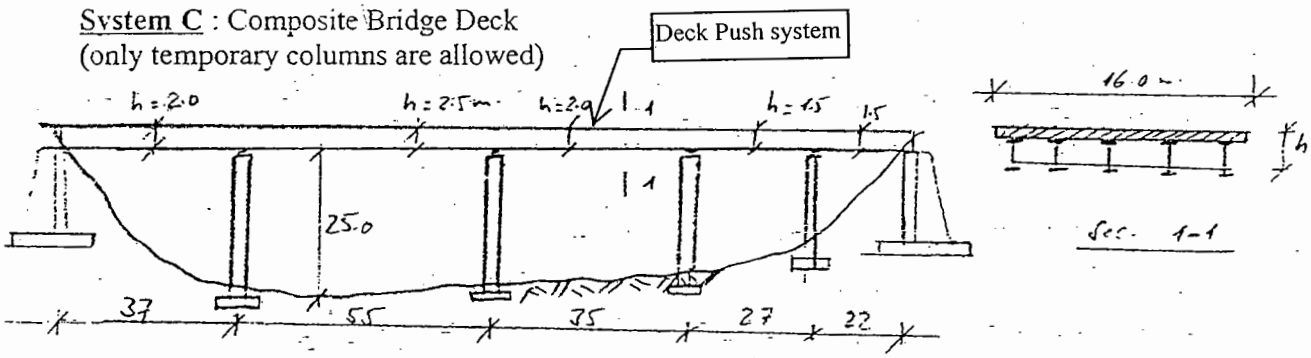
System A : Pre-stressed Concrete Bridge with a box section
(The area under the deck is not accessible)



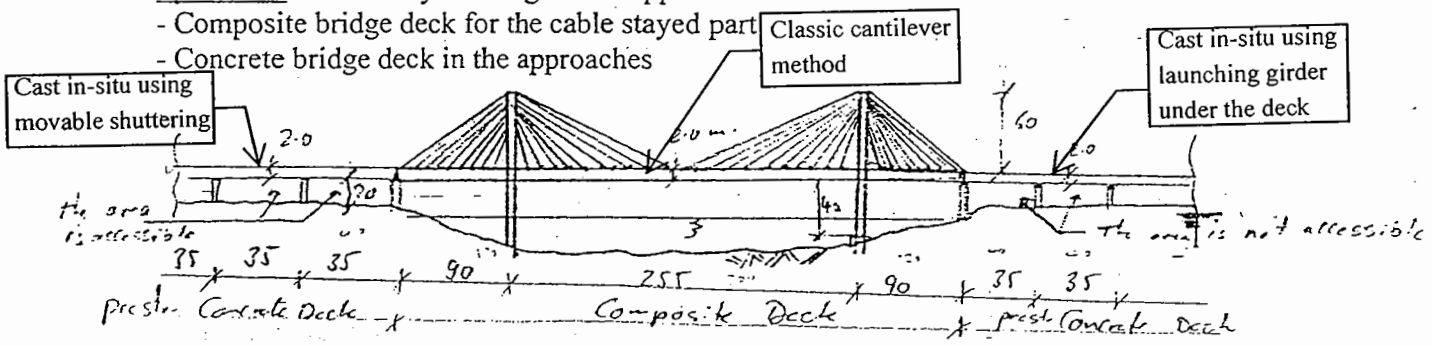
System B : Reinforced Concrete Bridge
(The area under the deck is not accessible in the main span)



System C : Composite Bridge Deck
(only temporary columns are allowed)



System D : Cable Stayed Bridge with Approaches
- Composite bridge deck for the cable stayed part
- Concrete bridge deck in the approaches

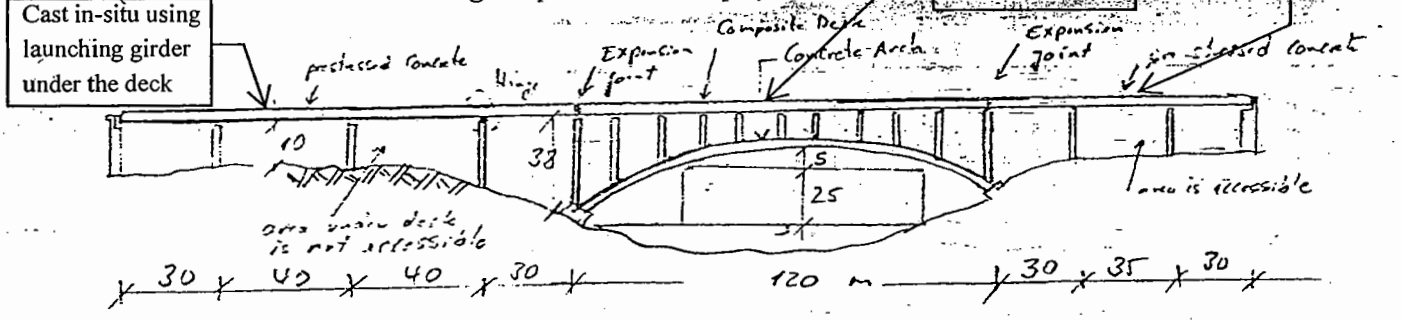


System E : Concrete Bridge Deck Supported on Concrete Arch
(The arch is constructed using the pre-cast technique)

Classic cantilever method

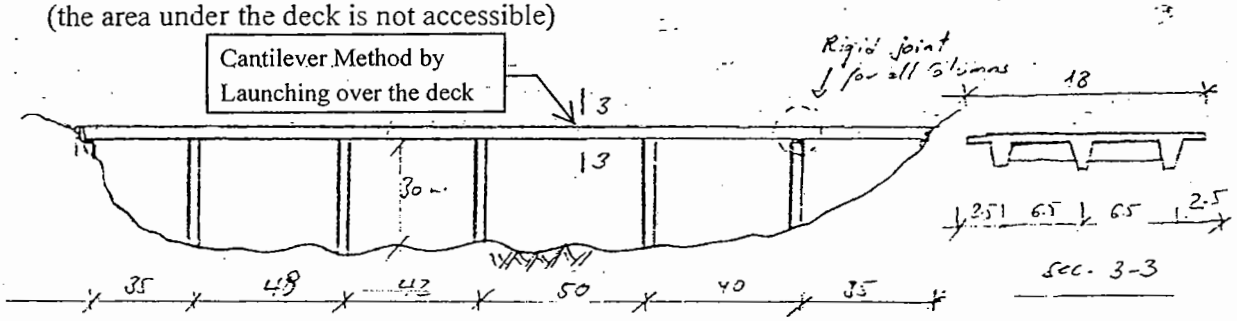
Cast in-situ using movable shuttering

Cast in-situ using launching girder under the deck



System F : Concrete Bridge Deck Supported on Steel Columns rigidly connected to deck
(the area under the deck is not accessible)

Cantilever Method by Launching over the deck



Question 2

1. Explain with sketches the different stages of the erection of cable stayed bridges. Describe also the erection of cables during the construction of this bridge.

2. State the boundary conditions for the application of launching system using launching girders under the deck and then explain when the designer should adopt the incremental launching system using launching girders over the deck.

3. Both Deck push system and launching system could be adopted for the construction of concrete bridge deck Which preferable in the following cases :

- Concrete bridge deck with spans of about 30 m and the area under the deck is not accessible Launching under the deck
- Composite bridge deck with spans up to 35 m and the area under the deck is not accessible. Deck push system
- Composite bridge deck with spans up to 60-70m, all the bridge vent over water channel. Launching over the deck
- Concrete bridge deck with spans ranges between 30 and 50 m, Pre-cast technique is to be adopted Launching over the deck

4. Explain the main advantages of the application of the precast technique in bridge construction.

5. What are the possible construction techniques which could be adopted in combination with the pre-cast technique to construct concrete bridges for the following span categories :

a) 20 up to 30 m **b)** 40 up to 60 m **c)** over 60 m

In each case explain the conditions for each choice

Launching over the deck

Launching over the deck

Classic cantilever

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd Year, *Structural Engineering Division*

1st Term 2004- 2005 — Time Allowed : 3 Hrs

Construction Techniques

The exam consists of 6 questions in four pages — Try all questions — 1/4

Question No. 1 (15 %)
Part 1

اكتب نبذة مختصرة عن:

أ- مقارنة بين الشدات المنزلقة والشدات القافزة للحوائط و الأعمدة و حدود استخدام كل منها.

ب- أهمية تصميم الشدات.

ج- مقارنة بين الشدات المعدنية و الخشبية.

د- الشدات المستديمة للمباني مع ذكر أمثلة

Part 2

ضع علامة ✓ أو X

١ -أكثر أنواع شدات الأعمدة شيوعا في مصر هى الشدات المنزلقة (X)

٢ -البلاطات الخرسانية سابقة الصنع (pre-slab) أحد أنواع الشدات المؤقتة (X)

٣ -يتم استخدام دكم داخل شدات الحوائط الخرسانية لتثبيت أسياخ التسليح فى أماكنها (X)

٤ -من فوائد الزراجين فى شدات الحوائط المحافظة على المسافات بين الأسياخ الأفقية (X)

٥- يسمح بصب ارتفاعات من الخرسانة في الأعمدة تصل الي ٤ متر مرة واحدة (X)

٦ -ينص الكود المصرى لاعمال الخرسانة المسلحة على أنه يمكن فك الجوانب
والتى تعمل كمجرد غلاف للخرسانة بعد مضى يومين من الصب (✓)

٧ -يتم استخدام فرشات تحت الشدات في الطوابق المتكررة للمبني (X)

Question No. 2 (20 %)

صمم الشدات الخشبية الحاملة لسقف يتكون من بلاطة مسطحة ذات تخانة ٥٥ سم علما بالاتى:

- يتم استخدام مضخات لصب الخرسانة.
- المقاسات المتاحة هى (٤x١) و(٤x٢) و(٦ x ٢) (٣x٣) و (٤x٤) بوصة x بوصة.
- ارتفاع الشدة الخشبية = ٢,٨٠متر.
- الإجهاد المسموح به في الانحناء ٨٠ كجم /سم٢.
- الإجهاد المسموح به في القص ١٢ كجم /سم٢.
- الإجهاد المسموح به في الضغط ٥٠كجم /سم٢ أو $0.3E/(H/b)^2$ أيهما أقل

$E = 100\ Ton/cm^2$

(3)

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3rd Year, *Structural Engineering Division*

1st Term 2004- 2005 — Time Allowed : 3 Hrs

Construction Technique

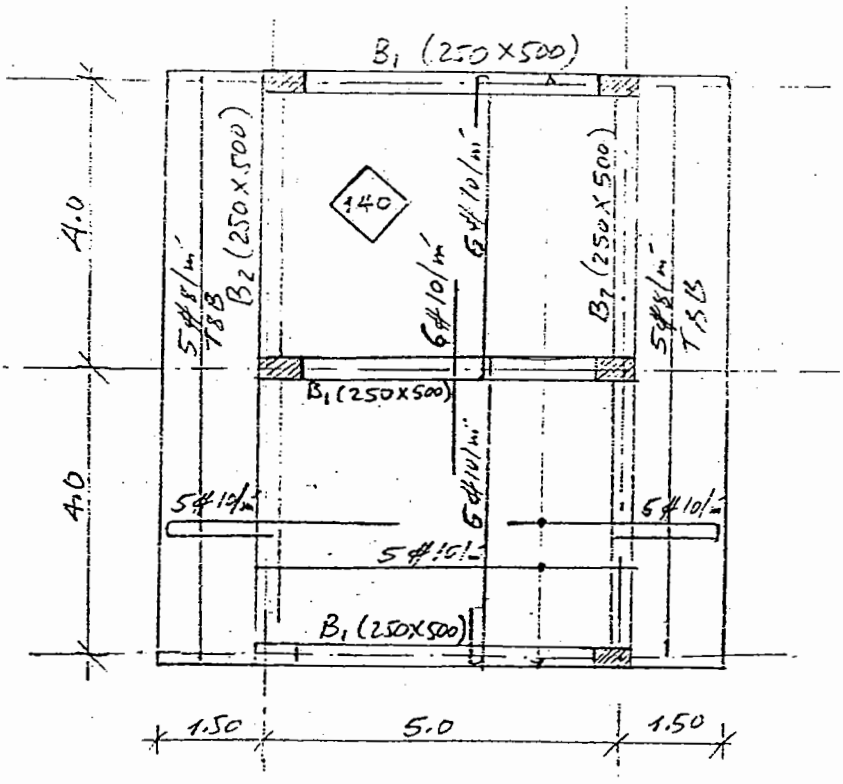
Question No. 3 (20 %)

For the Slab System and its Detail of Reinforcement shown in Fig. 1, it is required to:

- Calculate the bill of quantities of all slabs and beams.
- Show the bending list of their reinforcement.

(Specific Weight of Steel =7.85 t/m^3)

Beam Type	Bottom Rft.	Top Rft.	Stirrup/m	Remarks
B1	5ø 16	3ø 12	5ø 8/m'	
B2	4ø 16	4ø 16	5ø 8/m'	



t_s = 140 mms for all slabs

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Structural Engineering Department
3rd Year, *Structural Engineering Division*

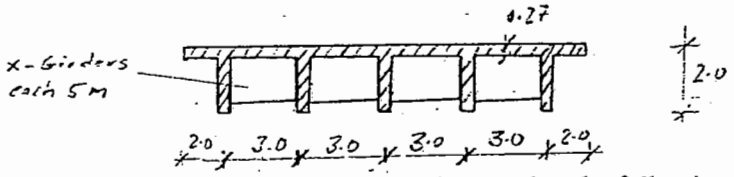
1st Term 2004- 2005 — Time Allowed : 3 Hrs

Construction Technique

3/4

Question No. 4 (15 %)

1. Explain the main aspects, which should be considered, when deciding the construction technique of a bridge
2. What is the designer main target of the bridge construction,
3. Explain the main advantages of the application of the pre-cast technique in bridge construction. What are the different forms of pre-cast techniques, which could be adapted for construction of concrete bridge with open section as shown in Fig. 1:



4. Describe briefly the construction procedures using the following techniques :

   a. Construction of a concrete bridge with 4 spans ranges between 50 and 60m using the segmental pre-cast technique [Launching over the deck]

   b. Construction of a concrete bridge with main span of 100m and two side spans each of 50 m using the segmental pre-cast technique [Classic cantilever]

   c. Erection of one stay cable during the construction of cable stayed bridges. [Classic cantilever]

   d. Construction of a concrete bridge of 5 spans each 20 m with girder type deck using the pre-slab technique. [Launching over the deck or Deck push system]

Question No. 5 (15 %)

Indicate if each of the following statements is right (√) or is wrong (X)

1. Over-stressing and residual stresses of the different structural elements of the end bridge should be avoided during the construction of the bridge. (✓)
2. For bridge construction in Egypt, the deck push system is the most frequent used technique. (X)
3. Metal shuttering is the much more durable than wooden shuttering. (✓)
4. For the construction of a cable stayed bridge the launching method is the most suitable method. (X)
5. For the application of the deck push system, the connection between deck and piers must be rigid. (X)
6. The pre-slab technique can be adapted with a max. spacing between longitudinal beams of 3 m. (✓)

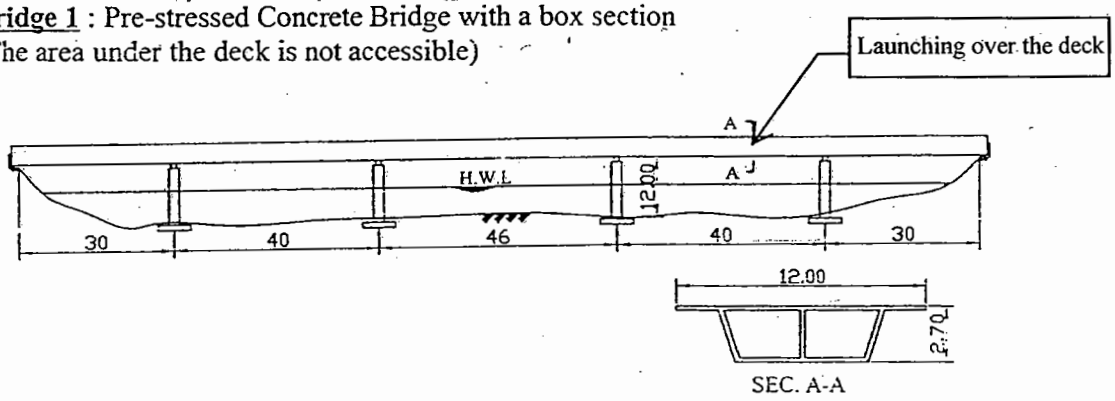
1st Term 2004- 2005 — **Time Allowed : 3 Hrs**

Construction Technique

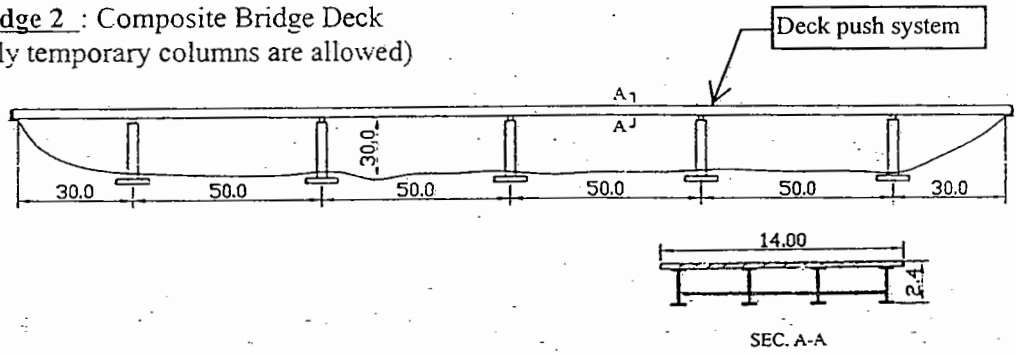
Question No. 6 (20 %)

For the following bridge systems, choose the most suitable construction technique for the construction of each bridge deck and explain why. Show some of the construction stages and draw for each stage with diagrammatic sketches, the main internal forces (e.g. B.M.D) in both structural elements of construction equipments and in the bridge deck :

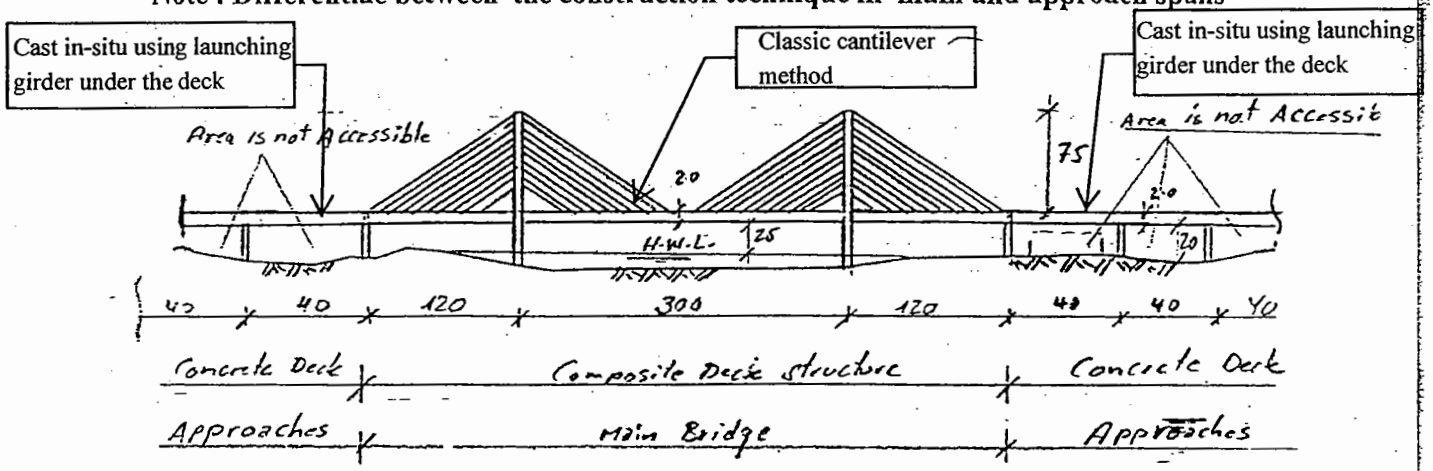
Bridge 1 : Pre-stressed Concrete Bridge with a box section
(The area under the deck is not accessible)



Bridge 2 : Composite Bridge Deck
(only temporary columns are allowed)



Bridge 3 : Cable Stayed Bridge with Approaches
Note : Differentiae between the construction technique in main and approach spans



Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division

1st Semester 2002-2003 **Time Allowed : 3 Hrs**

Construction Technique

The exam consists of 6 questions in four pages. Try all questions 1/4

Question No. 1 (15 %)

اكتب نبذة مختصرة عن:

أ- الطرق غير التقليدية لشدات الحوائط و الأعمدة.

ب- العناصر الثلاثة التى توضع فى الاعتبار عن تصميم وتنفيذ أي منشأ هندسى.

ج- مقارنة بين الشدات المعدنية و الخشبية.

Question No. 2 (20 %)

أحسب كميات الحديد والخرسانة لتنفيذ الكمرات والبلاطة للشكل رقم ١ مع عمل قائمة لتشكيل الحديد.

Question No. 3 (20 %)

صمم الشدات الخشبية الحاملة لسقف يتكون من بلاطة مسطحة ذات تخانة ٢٥ سم علما بالاتى

- يتم استخدام مضخات لصب الخرسانة.
- المقاسات المتاحة (٤x١) و(٤x٢) و(٦ x ٢) (٣x٣) و (٤x٤) بوصة x بوصة.
- ارتفاع الشدة الخشبية = ٢,٨٠متر.
- الإجهاد المسموح به في الإنحناء ١٠٠ كجم /سم٢.
- الإجهاد المسموح به في القص ١٠ كجم /سم٢.
- الإجهاد المسموح به في الضغط ٥٠كجم /سم٢ أو $0.3E/(H/b)^2$ أيهما أقل

$E = 100\ Ton/cm^2$

P.T.O

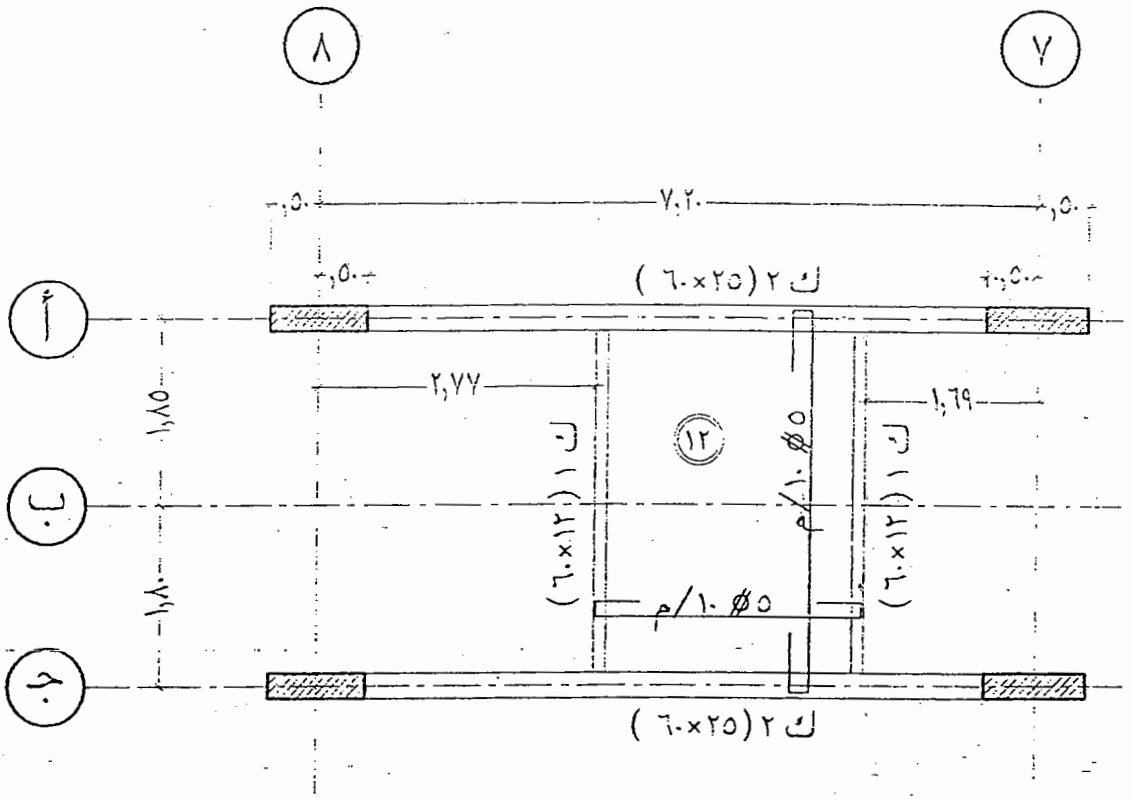
(٧)

Construction Technique

The exam consists of 6 questions in four pages Try all questions 2/4

جدول تسليح الكمرات

	تسليح سفلى		تسليح علوى	كانات
	عدل	مكسح		
ك١	٤ ⌀ ١٢	ـــــ	٢ ⌀ ١٢	٥ ⌀ ٨/م
ك٢	٤ ⌀ ١٨	ـــــ	٢ ⌀ ١٢	٥ ⌀ ٨/م



شكل رقم ١

ملحوظة كثافة الحديد ٧,٨٥ طن/ متر مكعب

P.T.O

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division
1st Semester 2002-2003

Time Allowed : 3 Hrs

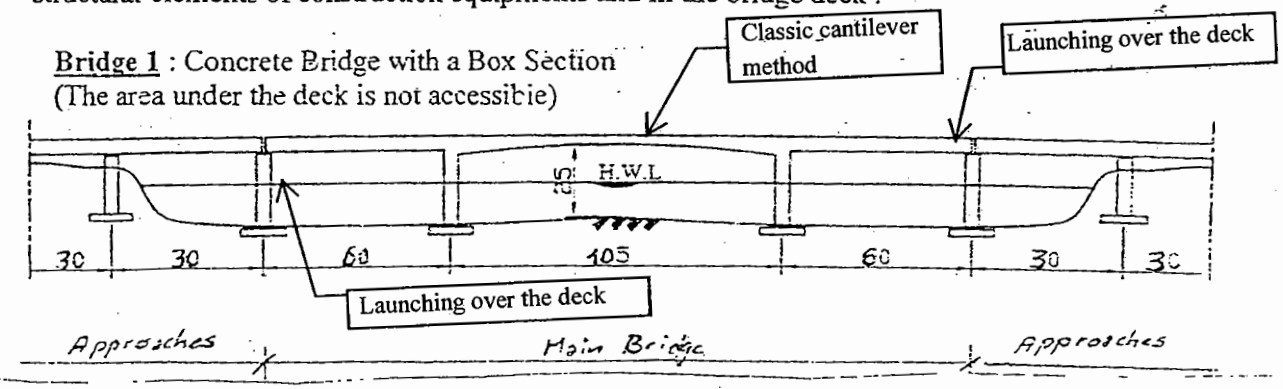
Construction Technique

The exam consists of 6 questions in four pages — Try all questions — 4/4

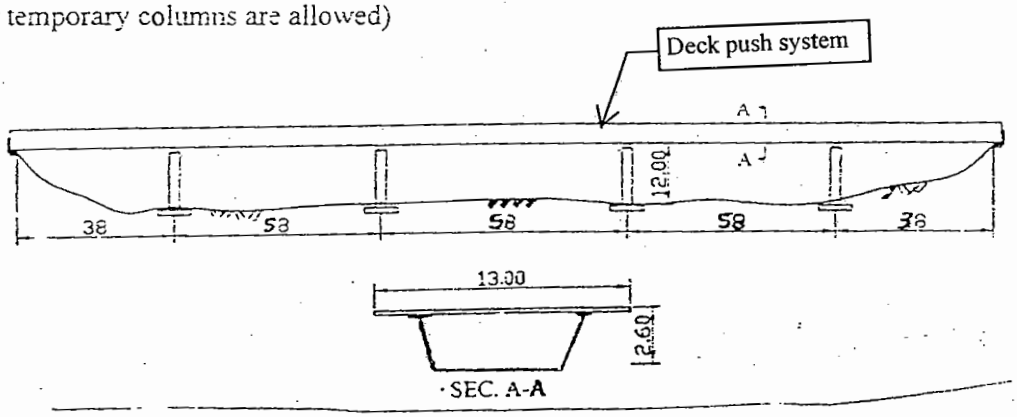
Question 6 (10 %)

For the following bridge systems, choose the most suitable construction technique for the construction of each bridge deck and explain why. Show some of the construction stages and draw for each stage with diagrammatic sketches, the main internal forces (e.g. B.M.D) in both structural elements of construction equipments and in the bridge deck :

Bridge 1 : Concrete Bridge with a Box Section
(The area under the deck is not accessible)



Bridge 2 : Composite Bridge Deck
(only temporary columns are allowed)



P.T.O

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division
1st Semester 2002-2003 **Time Allowed : 3 Hrs**

Construction Technique

The exam consists of 6 questions in four pages Try all questions 3/4

Question 4 (15 %)
Indicate if each of the following statements is right (√) or is wrong (X)

1. Over-stressing and residual stresses of the different structural elements of the end bridge should be avoided during the construction of the bridge. (√)
2. For bridge construction in Egypt, the deck push system is the most frequent used technique. (X)
3. Metal shuttering is the much more durable than wooden shuttering. (√)
4. For the construction of a cable stayed bridge the launching method is the most suitable method. (X)
5. For the application of the deck push system, the connection between deck and piers must be rigid. (X)
6. The pre-slab technique can be adapted with a max. spacing between longitudinal beams of 3 m. (√)
7. During the construction of a bridge using the classic cantilever method, the influence of the wind load can be neglected. (X)

Question 6 (30 %)

1. Explain the main aspects, which should be considered, when deciding the construction technique of a bridge
2. For construction of long concrete piers with height up to 40, explain what are the reasonable methods, which could be applied and compare between them, considering the construction duration, economy and the quality of concrete.
3. State the conditions, by which the push deck technique could be applied for construction of bridges.
4. What are the differences between launching system with launching girder under and launching girder over the deck, when could be each one applied for construction of concrete bridges.
5. Explain the main advantages of the application of the pre-cast technique in bridge construction. What are the different forms of pre-cast techniques, which could be adapted for construction of concrete bridge with open section as shown in Fig. 1:

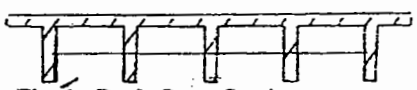


Fig. 1 : Deck Cross Section

P.T.O

(10)

Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division

1st Semester 2001-2002 — Time Allowed : 3 Hrs

Construction Technique

The exam consists of 6 questions in five pages — Try all questions — 1.5

Question No. 1 (14 %)

Part 1 (8%)

اكتب نبذة مختصرة عن:

أ- طريقتين غير تقليديتين لشدات الحوائط والأعمدة والحدود الاقتصادية لاستخدامهما.

ب- مقارنة بين الشدات المعدنية و الخشبية من حيث التكلفة على المدى القصير و البعيد.

Part 2 (6%)

ضع علامة √ أو X

١ -أكثر أنواع الشدات شيوعا في مصر هي الشدات المعدنية (X)

٢ -البلاطات الخرسانية سابقة الصنع (pre-slab) أحد أنواع الشدات الدائمة (√)

٣ - يحقق الاستخدام الأمثل للشدات النفقية في المنشآت ذات الطبيعة التكرارية (√)

٤ -ينص الكود المصري لأعمال الخرسانة المسلحة على أنه يمكن فك الجوانب والتي تعمل كمجرد غلاف للخرسانة بعد مضي ما لا يقل عن ٤ أيام (X)

٥ -ضغط الخرسانة الجانبي على شدات الأعمدة يحسب بضرب كثافة الخرسانة في ارتفاع العمود (√)

٦ -توصي المواصفات المصرية بتحديب فرد بطنيات الكمرات والبلاطات التي يجرها ٨ أمتار أو أكثر بمقدار ١/٣٠٠ الي ١/٥٠٠ من البحر (√)

Question No. 2 (20 %)

مطلوب عمل الأتي للسقف الموضح في شكل رقم ١:

أحسب كميات الخرسانة لتنفيذ السقف

عمل قائمة لتشكيل حديد البلاطات فقط.

Question No. 3 (20 %)

صمم الشدات الخشبية الحاملة لسقف يتكون من بلاطة مسطحة ذات سماكة ٢٥ سم علما بالأتي

يتم استخدام مضخات لصب الخرسانة

المقاسات المتاحة (٣x٣) و (٤x٤) و (٥x٥) بوصة x بوصة

ارتفاع الشدة الخشبية = ٢,٨٠ متر.

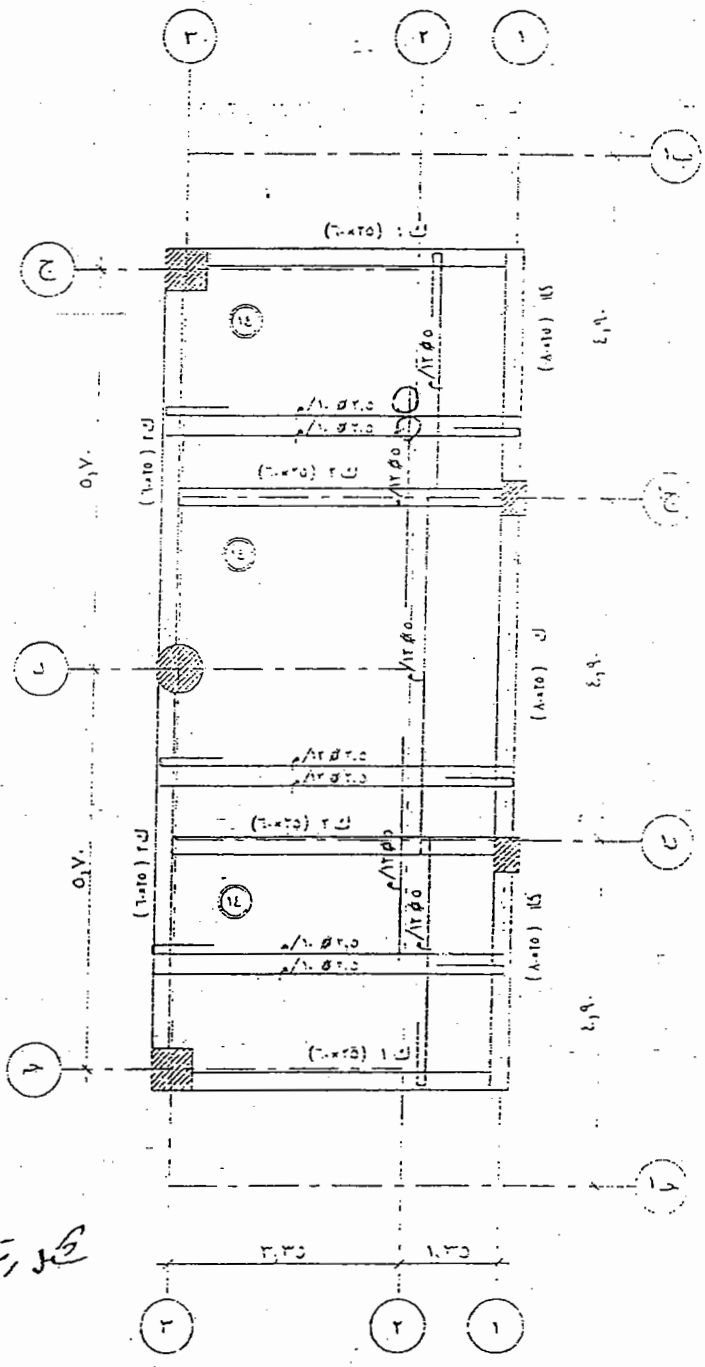
الاجهاد المسموح به في الضغط المحوري ٥٠ كجم /سم^2 أو $0.3E/(H/b)^2$ أيهما أقل

P.T.O

الاجهاد المسموح به في الضغط الناتج عن الانحناء ٧٠ كجم /سم^2

الاجهاد المسموح به في القص ١٠ كجم /سم^2

$E = 100\ Ton/cm^2$



شكل رقم "١"

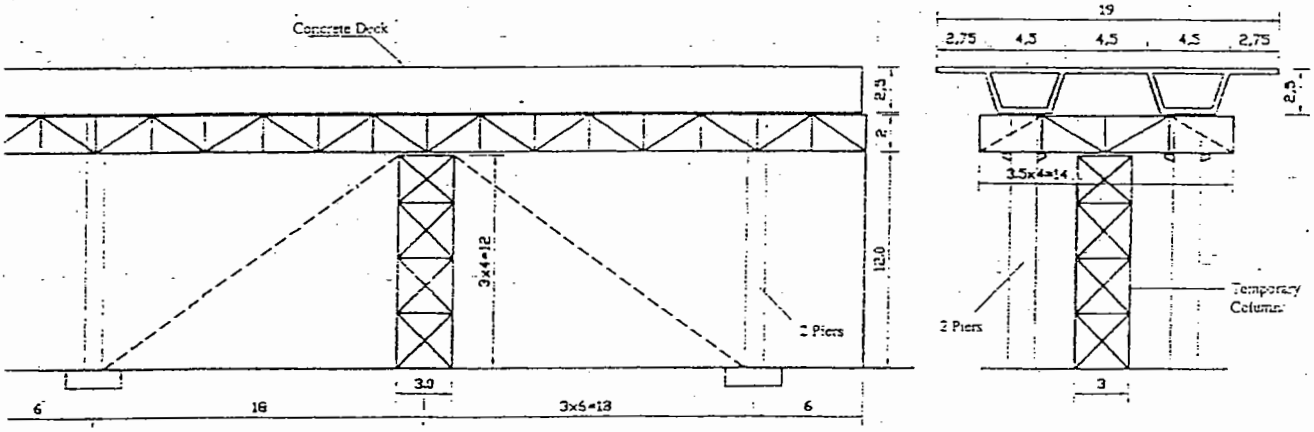
Question 4 (25 %)

Fig. 1 shows the construction technique used for construction of an intermediate panel of a concrete box girder bridge. The used steel truss girder is supported on both piers and additionally on temporary steel column in the main span. The truss girder is supported on the temporary column in vertical direction and horizontally only in the longitudinal direction (It means the wind load in transverse direction is to resisted only by bridge piers. It is required :

1. Calculate the max forces in diagonals and chord members in one of the 5 longitudinal truss girders and design their cross sections.
2. Explain with systematic sketches (without calculations) the wind load transfer in both longitudinal and transverse direction.
3. Calculate the vertical reaction on the temporary column.
4. Calculate the horizontal wind load on the temporary column in longitudinal direction and then design its verticals and diagonals for the following two cases :
   - Case 1 : without temporary cables
   - Case 2 : with temporary cables in longitudinal direction
5. For the case 2 with temporary cables, calculate the max force in the temp. cable and design its cross section.
6. For the same bridge deck, if the bridge has a single pier in transverse direction as shown in fig. 2, a truss girder with 3 long. girders is to be arranged, in this case show with systematic sketches the statical system of each long. truss girder under vertical loads and the qualitative shape of the bending moment.

Design Data :

- Own weight of the deck = 4.5 t/m^2
- L.L = 100 kg/m^2
- Wind Load for the deck and the shuttering in long. direction (w= f.q) =0.03x 150 kg/m^2
- Steel Type for truss girder St 52
- For cables :allowable tensile strength $f_{all.}$ = 10000 kg/cm^2

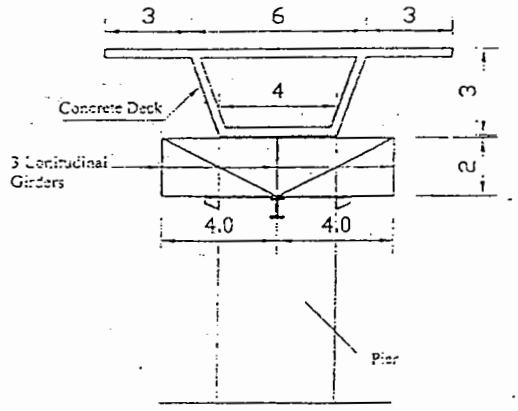


Elevation

Cross Section

Fig.1

P.T.O



Cross Section

Fig. 2

Question 5 (15 %)

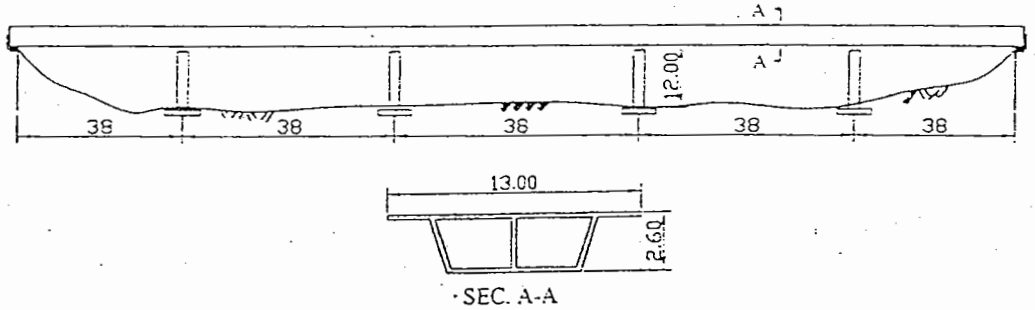
For the following bridge systems under the given conditions, choose the most suitable construction technique for the construction of each bridge deck and explain why. For each bridge: show some of the construction stages and draw for each stage with diagrammatic sketches, the main internal forces (e.g. B.M.D) in both structural elements of construction equipments and in the bridge deck :

Bridge 1 : Pre-stressed Concrete Bridge with a box section

Consider both cases :

a. The area under the deck is accessible and only temporary columns are allowed **Deck push system**

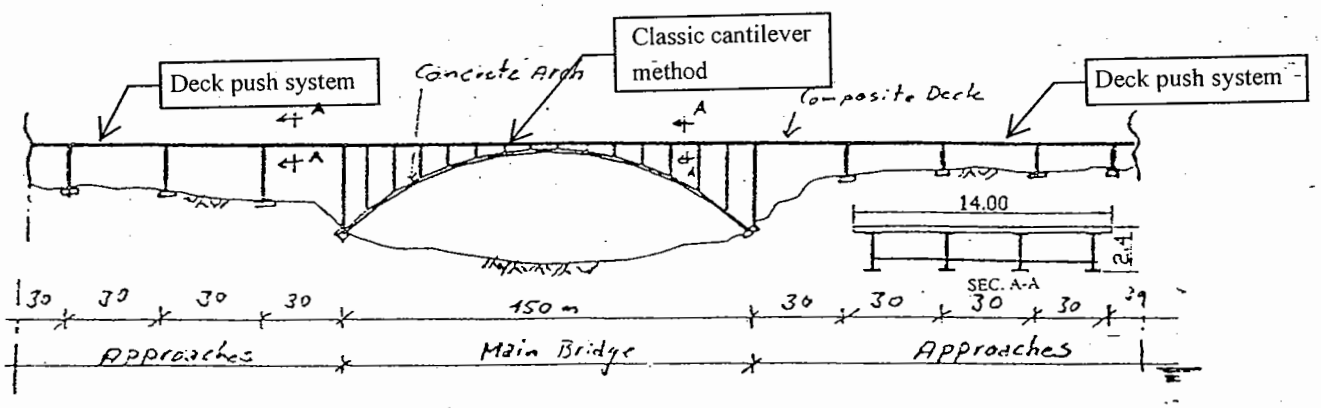
b. The area under the deck is not accessible at all **Launching over the deck**



SEC. A-A

Bridge 2 : Composite Bridge Deck over Concrete Arch

Note : Differentiae between the construction technique of the arch and the deck

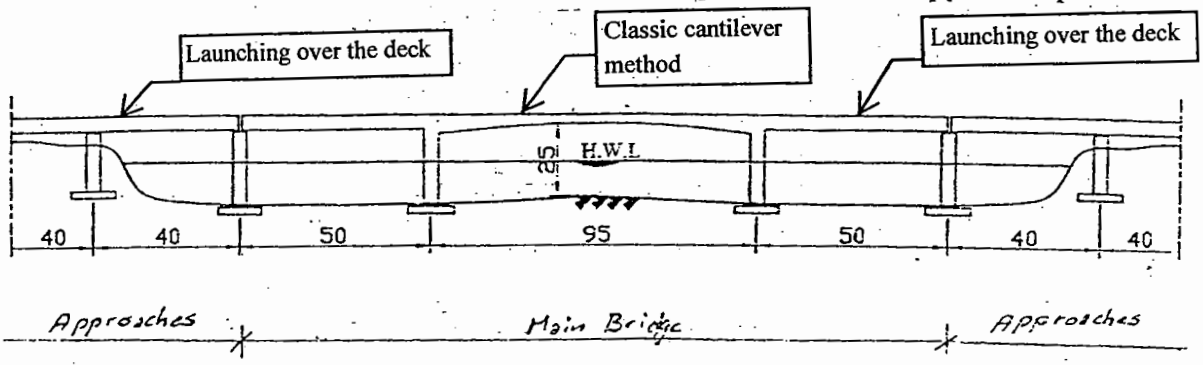


Construction Technique

The exam consists of 6 questions in five pages — Try all questions — 5/5

Bridge 3 : Pre-stressed Concrete Deck with Approach spans

Note : Differentiae between the construction technique in main and approach spans



Question 6 (15 %)

(short Questions)

1. Explain the main aspects, which should be considered, when deciding the construction technique of a bridge
2. What is the designer main target of the bridge construction.
3. For construction of long concrete piers with height up to 40, explain what are the reasonable methods, which could be applied and compare between them, considering the construction duration, economy and the quality of concrete.
4. Describe briefly the construction procedures using the following techniques :

   a. Construction of a concrete bridge with 4 spans ranges between 50 and 60m using the segmental pre-cast technique — Launching over the deck

   b. Construction of a concrete bridge with main span of 100m and two side spans each of 50 m using the segmental pre-cast technique — Classic cantilever

   c. Erection of one stay cable during the construction of cable stayed bridges. — Classic cantilever

   d. Construction of a concrete bridge of 5 spans each 20 m with girder type deck using the pre-slab technique. — Launching over the deck or Deck push system

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division

1st Semester 2001-2002 **Time Allowed : 3 Hrs**

Construction Technique

The exam consists of 6 questions in five pages Try all questions 1/5

Question No. 1 (15 %)

اكتب نبذة مختصرة عن:

أ-الأنواع المختلفة للشدات من حيث نوع مادة الشدة.

ب- أهم مميزات الشدات المنزلقة للحوائط و حدود استخداماتها.

ج – أهداف استكشاف مواقع المشروعات العملاقة.

Question No. 2 (20 %)

مطلوب عمل الأتي للسقف الموضح في شكل رقم ١:

أحسب كميات الخرسانة لتنفيذ السقف

عمل قائمة لتشكيل حديد البلاطات.

Question No. 3 (20 %)

صمم الشدات الخشبية الحاملة لحائط ساند بارتفاع ٤,٠٠ متر مع رسم قطاع رأسي للحائط مع الشدات علما بالأتي

المقاسات المتاحة (٣x٣) و (٤x٤) و (٥x٥) بوصة x بوصة

الاجهاد المسموح به في الضغط المحوري ٥٠ كجم /سم^2 أو $0.3E/(H/b)^2$ أيهما أقل

الاجهاد المسموح به في الضغط الناتج عن الانحناء ٧٠ كجم /سم^2

الاجهاد المسموح به في القص ١٠ كجم /سم^2

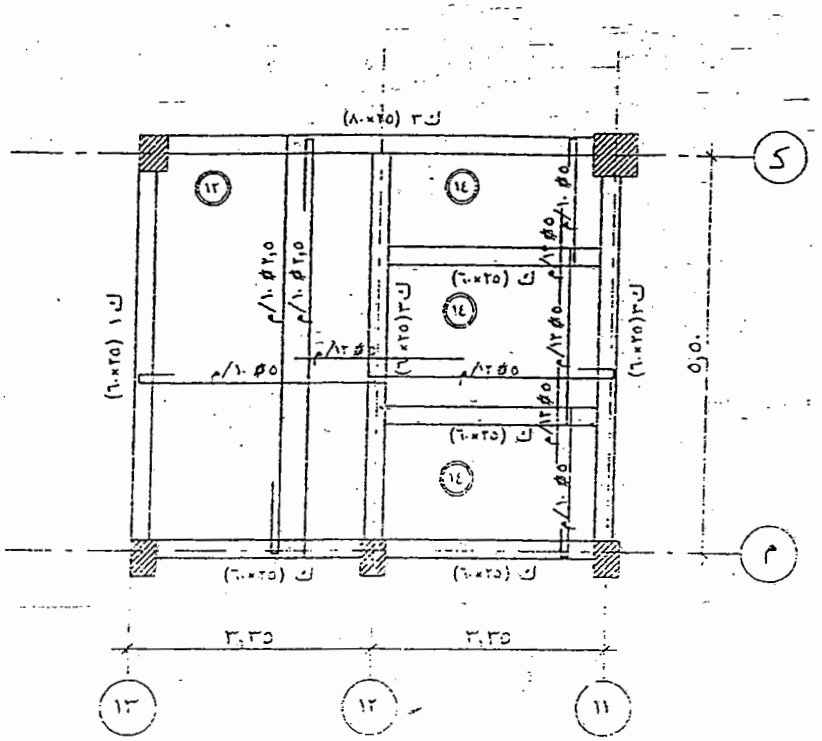
$E = 100$ Ton/cm^2

Rate of placement (R) = 1.50 m/hour.

Temperature (T) range = 30-35 degrees.

$$P_{max} = 5.03 * (150 + 9000 \frac{3.3 * R}{32 + 1.8T}) \text{ kg/m}^2$$

P.T.O



شكل رقم "١"

جدول تسليح الكمرات

	تسليح سفلى		تسليح علوى	كانات	ملاحظات
	عدل	مكسح			
ك	٢ ⌀ ١٢	——	٢ ⌀ ١٢	٥ ⌀ ٨/ م	
ك١	٢ ⌀ ١٢	٢ ⌀ ١٦	٢ ⌀ ١٠	٥ ⌀ ٨/ م	
ك٢	٢ ⌀ ١٦	٢ ⌀ ١٦	٢ ⌀ ١٠	٥ ⌀ ٨/ م	
ك٣	٤ ⌀ ١٦	٤ ⌀ ١٦	٢ ⌀ ١٦	٥ ⌀ ١٠/ م	
كا	٤ ⌀ ١٦	——	٨ ⌀ ١٦	٥ ⌀ ١٠/ م	

فى الكمرات بسيطة الارتكاز يتم تكسيح الحديد عند ١/٧ البحر
وفى الكمرات المستمرة يكسح الحديد عند ١/٥ البحر على أن
يستمر الحديد المكسح فى البحر المجاور ١/٣ البحر الاكبر

P.T.O

Construction Technique

The exam consists of 6 questions in five pages — Try all questions — 5/5

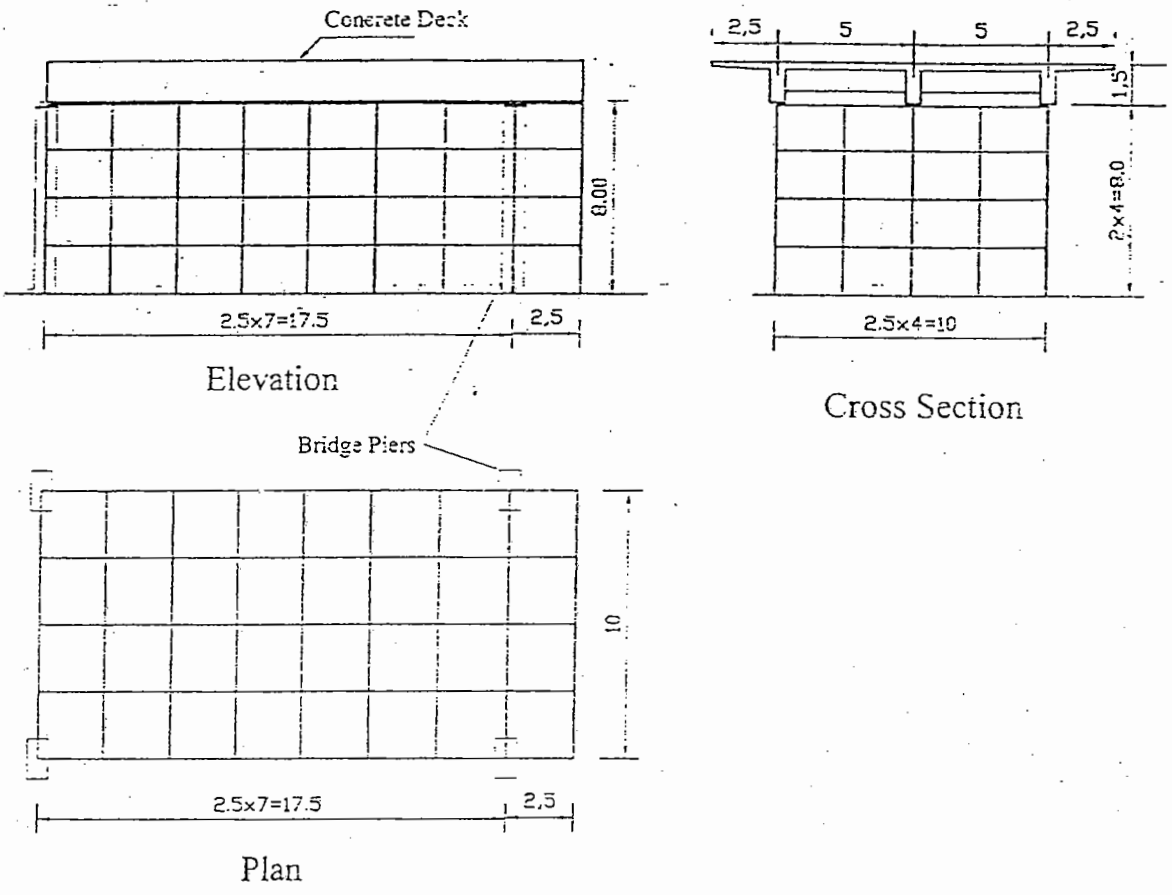


Fig. 2

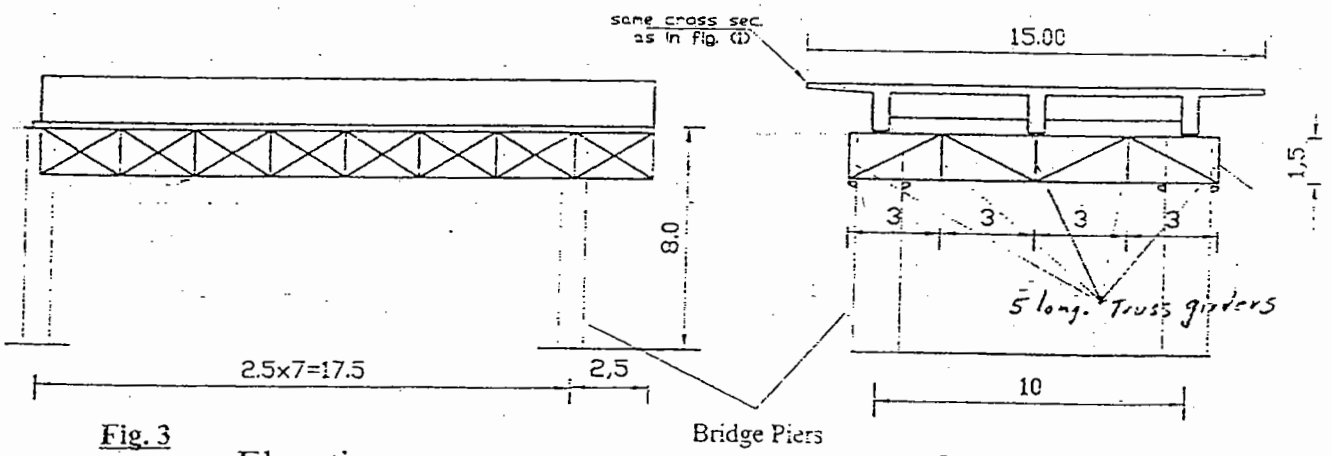


Fig. 3

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division

1st Semester 2000-2001 — Time Allowed : 3 Hrs

Construction Technique

The exam consists of 6 questions in five pages — Try all questions — 1/5

Question No. 1 (15 Degree)

١ – أذكر ٤ أنواع للشدات من حيث نوع مادة الشدة مع بيان إستخدامات كل منها.

٢ – ارسم شكل كروكي للشدة النفقية Tunnel form مع بيان مميزاتها.

٣ – أذكر ستة أهداف تحققها زيارة الموقع التى تتم بعد تجميع البيانات الأولية عن المشروع.

٤ – اذكر أهم مميزات الشدات المنزلقة مع بيان بعض استخداماتها.

٥ – اذكر الأهداف التى يحققها تصميم الشدة.

Question No. 2 (5 Degree)

ضع علامة (✓)أو(×):-

١ – يتم إستخدام دكم داخل شدات الحوائط للمحافظة على عرض الحوائط. (✓)

٢ – استخدام الشدات المنزلقة اقتصادى لإرتفاعات أقل من ١٥ متر. (×)

٣ – يتم إستخدام فرشات تحت الشدات الخشبية عند البناء للطرابيق المتكررة فوق الدور الأرضى (×)

٤ – تستخدم نهايز للشدات وذلك لتقليل تأثير الأنبعاج. (×)

٥ – تستخدم براندات للشدات لمقاومة الأحمال الأفقية. (×)

Question No. 3 (30 Degree)

أ–إحسب كميات الحديد والخرسانة لتنفيذ الكمرات والبلاطة للشكل رقم ١ مع عمل قائمة لتشكيل الحديد.

ب–إختار(بناء على حسابات) أقصى مسافة بين و كذلك قطاع القوائم الخشبية لشدات سقف يتكون من بلاطة مسطحة ذات خلخلة ٢٠ سم لا يتم استخدام مضخات لصبها علما بالاتى:

- المسافة بين الواح التطريح =٦٠سم — المسافة بين الواح التعريق = ٨٠سم
- قطاع السواح التعريق ٢×٦بوصة. — ارتفاع الشدة الخشبية = ٣,٩٠ متر.
- المقاسات المتاحة للقوائم (٣×٣) و (٤×٤) و (٥×٥) بوصة ×بوصة.
- الإجهاد المسموح به في الضغط. ٥٠كجم /سم^2 أو $0.3E/(H/b)^2$ أيهما أقل. $E = 90\ ton/cm^2$.
- الإجهاد المسموح به في العزوم ٧٠ كجم /سم^2 و في القص ١٠ كجم / سم^2.

P.T.O

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division
1st Semester 2000-2001

Time Allowed : 3 Hrs

Construction Technique

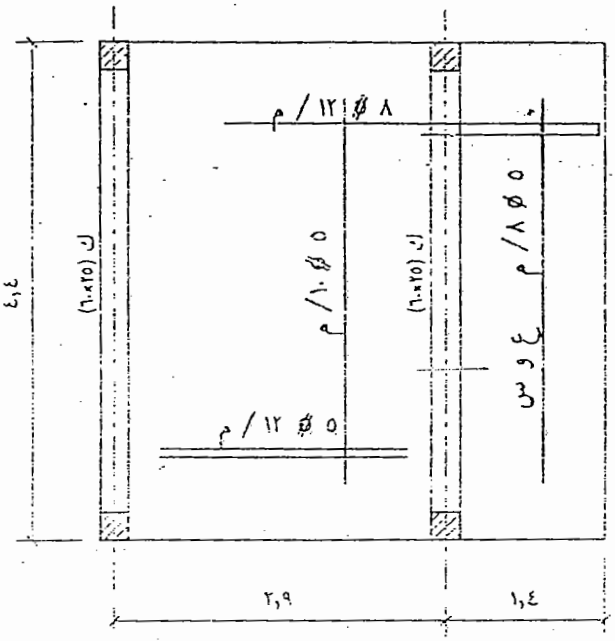
The exam consists of 6 questions in five pages — Try all questions — 2/5

جدول تسليح الكمرات

	تسليح سفلي		تسليح علوي	كانات
	عدل	مكسح		
ك	١٢ ⌀ ٤	—		

ملاحظات

١- تغانة جميع البلاطات ١٢ سم



شكل (١)

Question No. 1 (15 Degree)

Indicate if each of the following statements is right (√) or is wrong (X)

1. Assuming the fulfilment of the technical safety during the construction of a bridge, the aesthetical aspect is the most important aspect for the choice of the construction technique (X)
2. Over-stressing and residual stresses of the different structural elements of the end bridge should be avoided during the construction of the bridge. (√)
3. For bridge construction in Egypt, the deck push-system is the most frequent used technique. (X)
4. Wooden shuttering is the much more durable than metal shuttering. (X)
5. For the construction of a cabic stayed bridge the launching method is the most suitable method. (X)
6. For the application of the deck push system, the connection between deck and piers must be hinged. (√)
7. The pre-slab technique can be adapted with a max. spacing between longitudinal beams of 6 m. (X)

P.T.O

20

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division
1st Semester 2000-2001

Time Allowed : 3 Hrs

Construction Technique

The exam consists of 6 questions in five pages -- Try all questions 3/5

8. Launching method with truss girder over the deck level can be combined with the pre-cast technique to construct segmental concrete bridges with spans up to 60 m over very high valley. (✓)

9. If the area under the bridge location is not available to arrange shuttering during the construction of bridges with spans ranges between 30 and 60 m, the cantilever method is the most suitable technique to be adapted. (X)

10. For construction of a composite deck of a bridge with a height of 30 m over the water level and spans up to 50m, the push deck system is an alternative, which could be adapted. (X)

11. Pre-cast technique is the most suitable method for construction of bridges with steel decks and spans up to 30 m. (✓)

12. The construction rate of high concrete towers using climbing (jumping) forms is faster than the use of the slip forms. (X)

13. During the deck pushing, the produced friction forces between the deck and piers are close to be zero. (X)

14. The use of additional beams (aids beams) with the launching system reduces the internal forces in the deck during the construction. (✓)

15. During the construction of a bridge using the classic cantilever method, the influence of the wind load can be neglected. (X)

Question No. 5 (20 Degree)

For the construction of the shown bridge deck in Fig. 2, a supporting wooden shuttering over the whole length of the span was arranged during the construction of the concrete bridge deck (assuming that the piers were already constructed before this stage). For the given shuttering system, it is required to proceed the following :

1. Calculate the max. force in the vertical members and then design their cross section (allowable compressive stress $f_{c,all}$ =80 kg/cm^2)
2. Choose a suitable wind bracing system in the vertical and horizontal planes and show their arrangement with rough sketches.
3. Show without any calculation the load distribution for these wind bracing systems
4. Calculate the max. forces only in one of the vertical bracing resisting the transverse wind and estimate their cross section (allowable tensile stress $f_{t,all}$ = 60 kg/cm^2)

P.T.O

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division
1st Semester 2000-2001 **Time Allowed : 3 Hrs**

Construction Technique

The exam consists of 6 questions in five pages Try all questions 4/5

Design Data for Question 5 :

- Neglect the own weight of the wooden members of the supporting shuttering
- Live load (during construction) = 100 kg/m^2
- Wind load product (c. q.) for the deck and the shuttering = 100 kg/m^2
- For the calculation of the wind load on shuttering a filling percentage of 30 % of the area projection is to be considered, (for example W_t = c.q x 0.30 x A_{shutt})

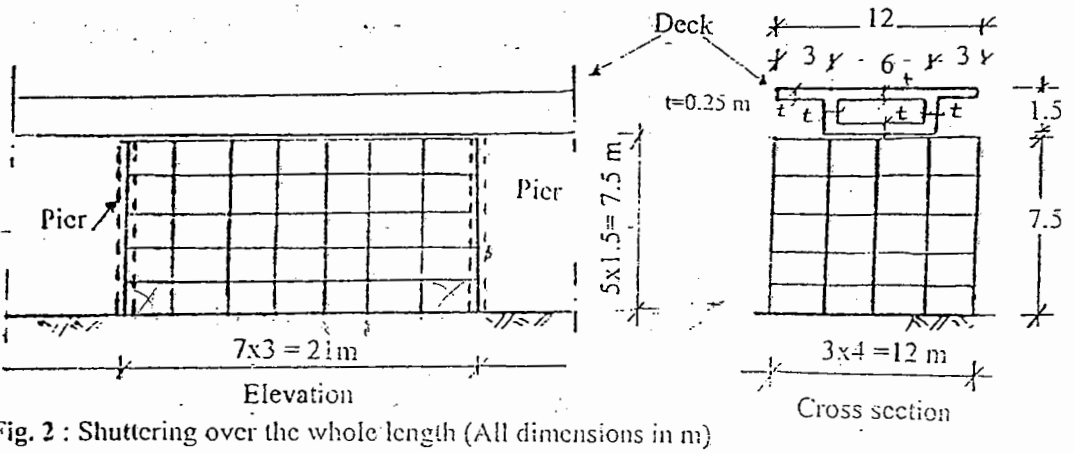


Fig. 2 : Shuttering over the whole length (All dimensions in m)

Question No. 6 (25 Degree)

a) During the construction of the bridge deck in Fig. 3a, a rigid steel space truss girder was arranged to support the form-work of the deck. The truss girder is supported on the piers and additionally on a temporary steel column in the mid-span. Assuming the own weight of the deck to be 1.0 t/m^2 , L.L. of 100 kg/m^2 and wind load (c.q) of 130 kg/m^2, it is required to:

- Calculate the max. vertical load on one of the two main longitudinal trusses and calculate roughly the max. force in the diagonal members of this truss and then design this member. (allowable tensile stress $f_{t,all}$ = 2000 kg/cm^2)
- Calculate roughly the max. total vertical force on the temporary column.
- Assuming that the truss girder is only connected into the temporary column in the longitudinal direction (i.e. there is no horizontal load transfer from the truss to the temporary column in the transverse direction), proceed the following :
  - draw the statical system for the supporting system of the wind load in transverse direction and then calculate the horizontal wind load in transverse direction.
  - Assuming a total wind load on the bridge and shuttering in the longitudinal direction per long. meter of 70 kg/m , calculate the wind load reaction on the temporary column in the longitudinal direction.
  - Calculate the max. force in the temporary cables, and then design these cables. ($f_{t,ca}$ = 8000 kg/m^2)

P.T.O

Ain Shams University
Faculty of Engineering
Structural Engineering Department
3rd year, Structural Engineering Division
1st Semester 2000-2001

Time Allowed : 3 Hrs

Construction Technique

The exam consists of 6 questions in five pages — Try all questions — 5/5

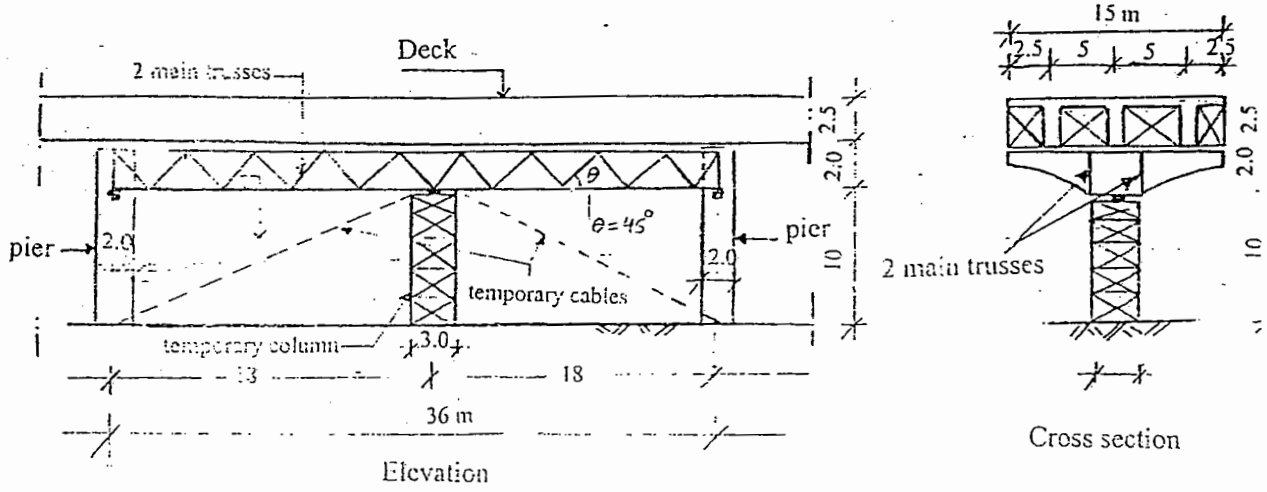


Fig. 3a : Construction technique using truss girder supported on piers and tempo. column (All dimensions in m)

b) For the given bridge deck, if the span increased to be 55 m, which structural elements should be added to keep the choice of the same construction method.

c) Assuming a fixation of the truss girder with the temporary column in the transverse direction, is it an advantage to use temporary cables in the transverse direction as shown in Fig. 3b ? explain why ?

d) For another alternative technique for the previous bridge deck, it is assumed to use the pre-cast technique for the girders and cast in situ technique for the deck slab, it is required to :

1. Draw the detail for the joint A in Fig. 3c
2. Show roughly the distribution of the shear connector over the span length
3. Which construction technique should be adapted to eliminate the use of shuttering? and which changes in the arrangement of longitudinal girders should be done to enable the application of this construction technique ?

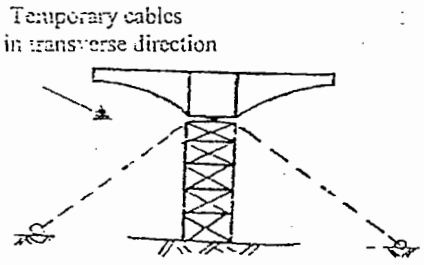


Fig. 3b

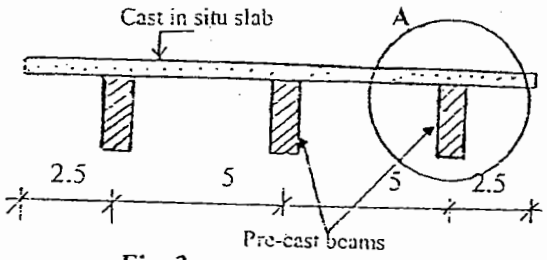


Fig. 3c

Ain Shams University
Faculty of Engineering
Structural Engineering Department
4th year, Structural Engineering Division

2nd Semester 2006-2007 — Time Allowed 1.5 Hrs

Construction Technique

The exam consists of 5 questions in 2 pages — Try all questions 1/2

Question No. 1 (15

١ - أذكر ٤ أنواع للشدات من حيث نوع مادة الشدة مع بيان إستخدامات كل منها.

Question No. 2 (5

ضع علامة (✓)أو (×):-

١ - يتم إستخدام دكم داخل شدات الحوائط للمحافظة على عرض الحوائط. (✓)

٢- استخدام الشدات المنزلقة اقتصادى لإرتفاعات أقل من ١٥ متر. (X)

٣ - يتم إستخدام فرشات تحت الشدات الخشبية عند البناء للطوابق المتكررة فوق الدور الأرضى (X)

٤ - تستخدم نهايز للشدات وذلك لتقليل تأثير الأنبعاج. (X)

Question No. 3 (30

-إختار (بناء على حسابات) أقصى مسافة بين و كذلك قطاع القوائم الخشبية لشدات سقف يتكون من بلاطة مسطحة ذات تخانة ٢٥ سم لا يتم استخدام مضخات لصبها علما بالاتى :-

- المسافة بين الواح التطريح =٦٠سم — المسافة بين الواح التعريق = ٨٠سم
- قطاع الواح التعريق ٢×٦بوصة. — ارتفاع الشدة الخشبية = ٣,٩٠ متر.
- المقاسات المتاحة للقوائم (٣×٣) و (٤×٤) و (٥×٥) بوصة ×بوصة.
- الإجهاد المسموح به في الضغط ٥٠كجم /سم٢ أو $0.3E/(H/b)^2$ أيهما أقل. $E = 90\ ton/cm^2$.
- الإجهاد المسموح به في العزوم ٧٠ كجم /سم٢ و في القص ١٠ كجم / سم٢.

(24)

Ain Shams University
Faculty of Engineering
Structural Engineering Department
4th Year, *Structural Engineering Division*

2nd Term 2006- 2007 — Time Allowed : 3 Hrs

Construction Technique

2/2

Question No. 4 (20 %)

1. Explain the main aspects, which should be considered, when deciding the construction technique of a bridge.
2. What is the designer main target of the bridge construction.
3. Explain the main advantages of the application of the pre-cast technique in bridge construction. What are the different forms of pre-cast techniques, which could be adapted for construction of concrete bridge with open section as shown in Fig. 1:

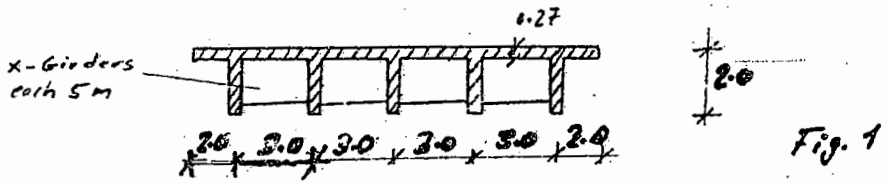
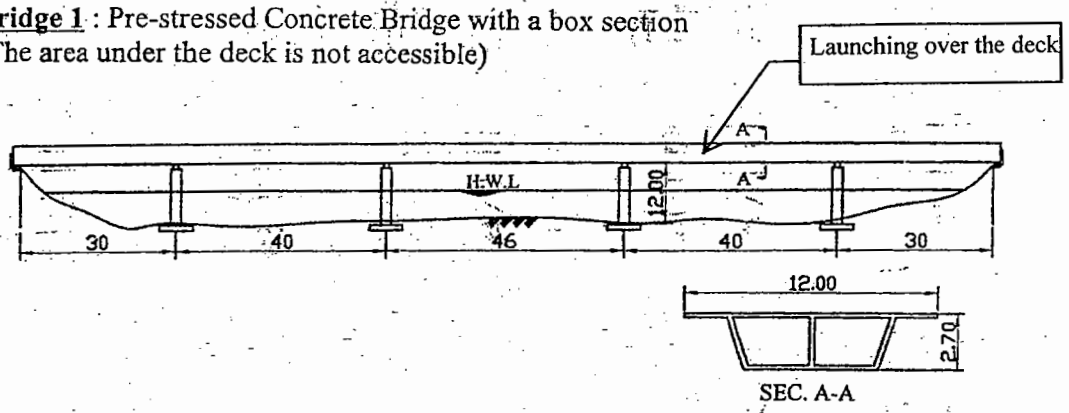


Fig. 1

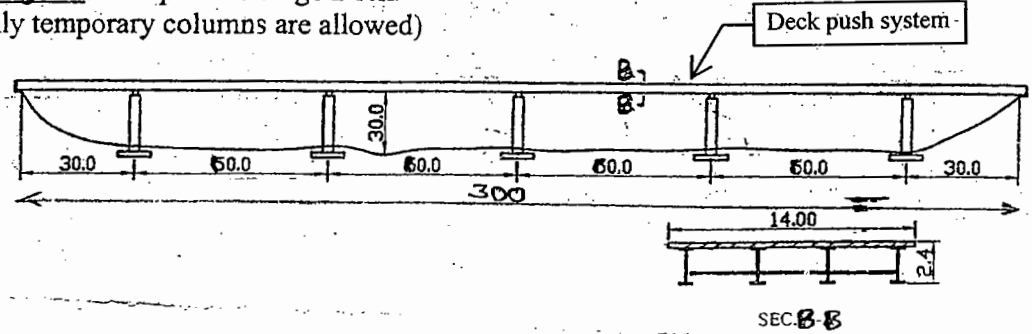
Question No. 5 (30 %)

For the following bridge systems, choose the most suitable construction technique for the construction of each bridge deck and explain why. Show some of the construction stages and draw for each stage with diagrammatic sketches, the main internal forces (e.g. B.M.D) in both structural elements of construction equipments and in the bridge deck :

Bridge 1 : Pre-stressed Concrete Bridge with a box section
(The area under the deck is not accessible)



Bridge 2 : Composite Bridge Deck
(only temporary columns are allowed)



25

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL ENGINEERING DEPARTMENT
4th Year, Civil Engineering (Structural Division)

June 2007 **OPEN BOOK EXAM** ***Time : 3:00 Hrs***

Construction Techniques of Concrete Structures

The Exam Consists of **Six** Questions in **four** Pages. **1/4**

Systematic arrangement of calculations and clear neat drawings are essential.
Any data not given can be reasonably assumed.

Used materials in all Questions: Concrete: f_{cu} = 30 MPa and Steel 36/52.

Question (1) (25% of maximum credit)

Fig. 1 shows a box girder bridge layout during construction of an intermediate deck panel of a 36m span. The bridge deck shall be cast in-place on a rigid steel truss girder, which is supported vertically and horizontally on an a temporary steel column in the mid-span in addition to the bridge columns. **It is required to:**

1. Calculate the max. design forces in the diagonals and in the chord members of one of the three longitudinal steel trusses supporting the deck during construction.
2. Design the cross sections of those truss members
3. Without any calculation, explain using systematic sketches the wind load transfer on the deck and shuttering during construction in horizontal direction only.
4. Calculate the horizontal wind load in long. direction on the temporary column during construction taking into account that it is supported by temporary cables as shown in fig. 1
5. Calculate the max forces in the temporary cables.
6. Calculate the design vertical and horizontal forces in the temporary column and then design one of its verticals.

Design Data:
Own wt of the deck = 12.0 kN/m^2 - L.L = 1.0 kN/m^2
Wind load in long. Direction / unit surface area of the deck = 0.01 kN/m^2

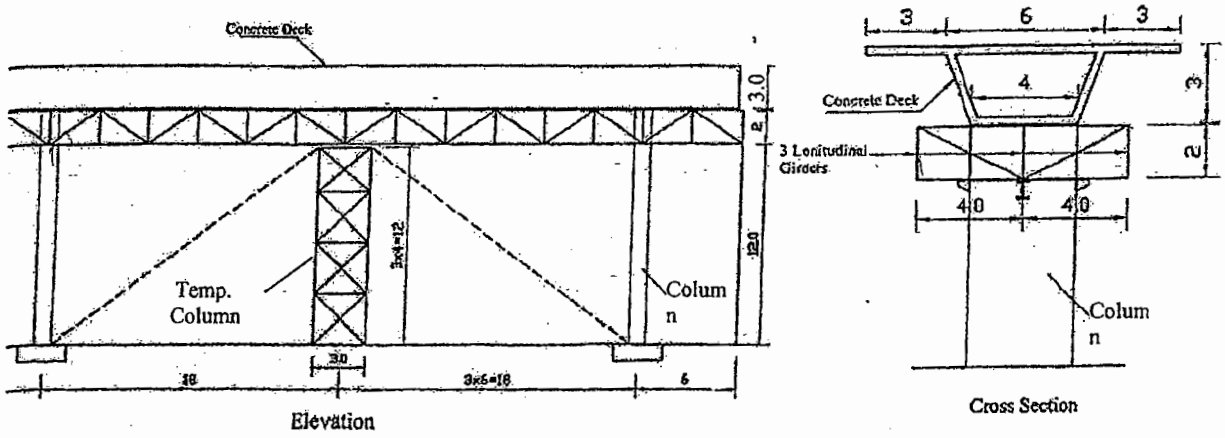


Fig. 1

P.T.O

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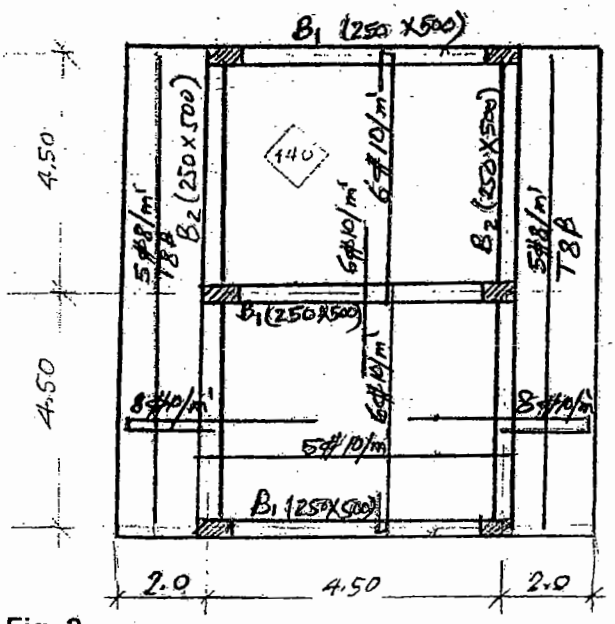
Question (2) (25% of maximum credit)

a) For the reinforced concrete slab shown in Fig. 2, **it is required to** :
- Calculate the Bill of quantities of all concrete slabs and beams,
- Calculate the area of shuttering and
- Comment on the shuttering area/m^2 of slab and weight of St. reft/m^3 of concrete



Beam Type	Bottom R.f.	Top R.f.	Stirrup/m
B1	5ø 16	3ø 12	5ø 8/m'
B2	4ø 16	4ø 16	5ø 8/m'

Fig. 2

b) For the following two bridge systems in Fig. 3a & 3.b, **it is required to** choose the most feasible construction technique in each case showing different construction stages. In each stage show with systematic sketches the B.M.D. in structural elements of both the bridge and of the construction equipments.

Bridge 1: Prestressed Concrete with a box section:
Consider both cases:
a. The area under the deck is accessible and only temporary columns are allowed. Deck push system
b. The area under the deck is not accessible at all. Launching over the deck

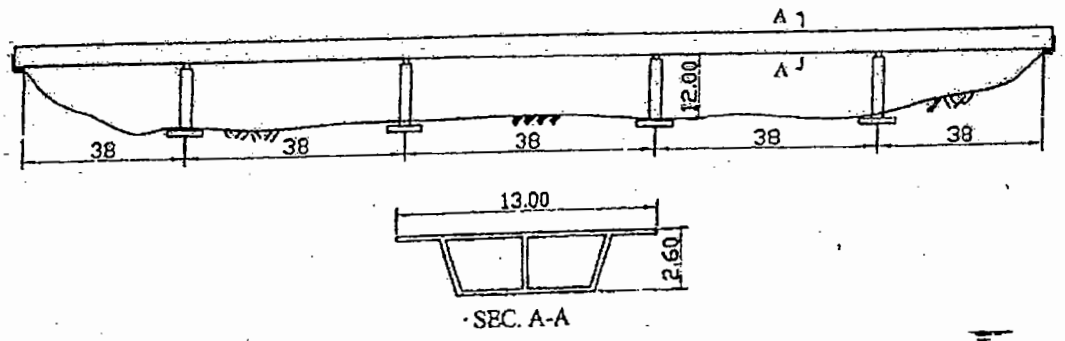


Fig. 3a

P.T.O.

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Bridge 2: Composite Bridge Deck over Concrete Arch
– **(Note:** Differentiate between the construction of the arch and the deck)

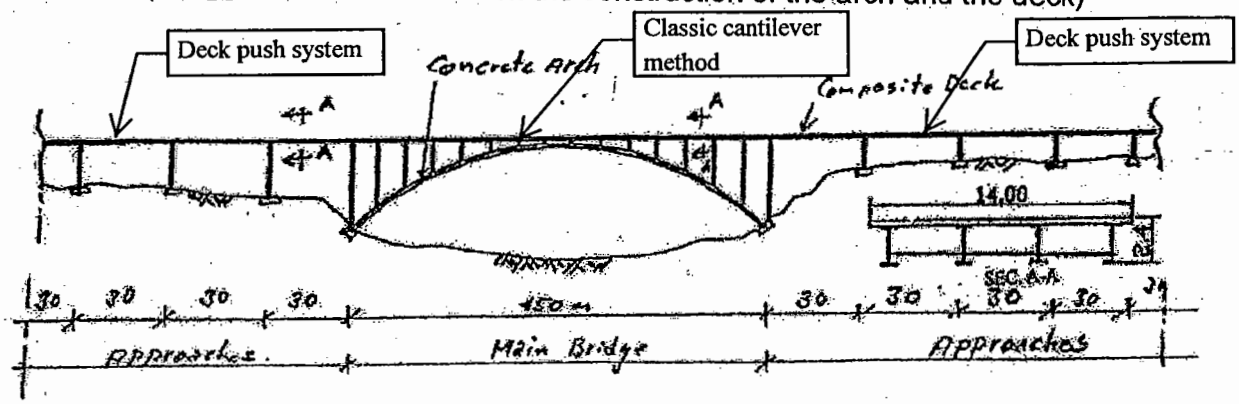

Fig. 3b

Question (3) (10% of maximum credit)

Indicate if each of the following statements is right or wrong and then correct the mistakes.

1. Over-stressing and residual stresses of the different structural elements of the end bridge should be avoided during the construction of the bridge. (✓)
2. For bridge construction in Egypt, the deck push system is the most frequent used technique. (X)
3. Metal shuttering is the much more durable than wooden shuttering. (✓)
4. For the construction of a cable stayed bridge the launching method is the most suitable method. (X)
5. For the application of the deck push system, the connection between deck and piers must be rigid. (X)
6. The pre-slab technique can be adapted with a max. spacing between longitudinal beams of 3 m. (✓)
7. During the construction of a bridge using the classic cantilever method, the influence of the wind load can be neglected. (X)
8. Launching method with truss girder over the deck level can be combined with the pre-cast technique to construct segmental concrete bridges with spans up to 60 m over very high valley. (✓)
9. If the area under the bridge location is not available to arrange shuttering during the construction of bridges with spans ranges between 30 and 60 m, the cantilever method is the most suitable technique to be adapted. (X)

P.T.O.

Question (4) (15% of maximum credit)

a) For the structure shown in Figure 2, what is the minimum time for removal of the forms for the following elements (ordinary Portland cement is used):
- Columns.
- Side form for beams.
- Forms of the slabs. Justify your answer.

b) Suggest a suitable construction technique for each of the following elements. Draw schematic sketches showing your concept.
- Columns carrying super structures of a bridge. (column height = 80 meters).
- Columns carrying a roof of an exhibition center. (column height = 15 meters).

c) Give examples for the permanent forms in structures.

Question (5) (20% of maximum credit)

Design the wooden form elements for a reinforced concrete wall with a height of 2.5 meters and thickness of 25 cm. Draw to scale 1:20 an elevation of the elements of the form.
Data:
Available wood sizes are 12.5 cm x 12.5 cm, 10 cm x 10 cm, 10 cm x 7.5 cm, 7.5 cm x 7.5 cm and 10 x 2.50 cm.
Allowable bending stress is 80 kg/cm^2.
Allowable shear stress is 10 kg/cm^2.

Allowable axial compression is the smaller of 50 kg/cm^2 or $\frac{0.3E}{(H/b)^2}$

E = 100 Ton/cm^2
Rate of placement (R) = 1.50 m/hour.
Temperature (T) range = 30-35 degrees.

$$P_{max} = 5.03 * (150 + 9000\frac{3.3 * R}{32 + 1.8T}) \text{ kg/m}^2$$

Question (6) (20% of maximum credit)

Design the wooden form elements for a reinforced concrete flat slab with a thickness of 300 mm. Height of the form is 2.80 meters. Draw to scale 1:20 an elevation showing the elements of the form.
Data:
Available wood sizes are 15 cm x 5 cm, 10 cm x 5 cm, 7.5 cm x 7.5 cm and 10 x 2.50 cm.
Allowable bending stress is 90 kg/cm^2.
Allowable shear stress is 10 kg/cm^2.

Allowable axial compression is the smaller of 50 kg/cm^2 or $\frac{0.3E}{(H/b)^2}$

Allowable deflection of the form elements is 2 mm.
E = 100 Ton/cm^2