Dept.: Structural Engrg.	**Faculty:** Engineering	**University** : Tanta
Time allowed: 3 hr. **Date:** June 2016	**Course:** Design of steel structures (b)	**Course code:** S & C CSE 3124

Note:

- It is allowed to use any tables or Egyptian Code of Practice books.
- Any missing data may be reasonably assumed.
- Attempt all questions. **Max. Credit 100 % only**.
- Number of examination pages: (4).

Total: 120 %

Question (1) **(20 %)**

An industrial factory, covering the area shown in **Fig. 1**, is to be covered. The factory contains of two parts; Parts A and B. Part A contains a crane moving in the direction shown in the figure. The columns are allowed at the outer edges of the covered area as well as the edge between both areas, as shown in the figure. The crane is going to carry the raw materials from outside the factory with an extension of 10m **(the extension part is not covered)**. The cross-sections of the columns in this extension are made from battened beam-column members composed of two channel sections. The clear height of the columns in the covered area should not be less than 10 m. It is required to draw the layout to an appropriate scale, showing all bracing systems, of the suggested steel structure.

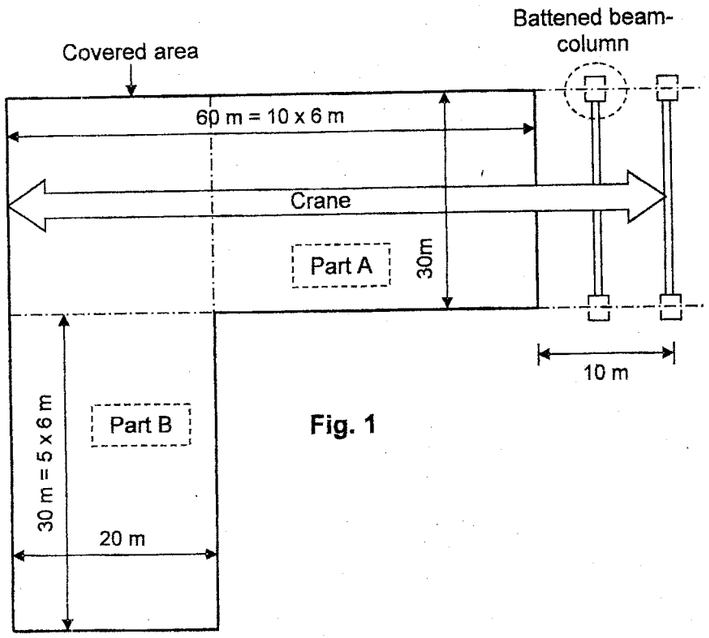


Fig. 1

Question (2) **(25 %)**

The **battened beam-column members** shown **Fig. 1**, assuming the following side view (S.V.) of **Fig. 2**, is to be built. The straining actions at the critical section of the column (s-s) are $N_u = 35\,t$, $M_u = 15\,t.m$ and $Q_u = 5\,t.m$. The steel used is St 52. It is only required to:

(a) Discuss the main difference in **both behaviour and design** between this column and the conventional plain-webbed I-section columns. **(2.5 %)**
(b) Suggest the layout of the column showing the dimensions of the batten plates and the suggested spacing between them. **(5 %)**
(c) Design the column as a built-up column formed from two C-channels with welded batten plates. **(15 %)**
(d) Design the batten plates by finding their thickness. **(2.5 %)**

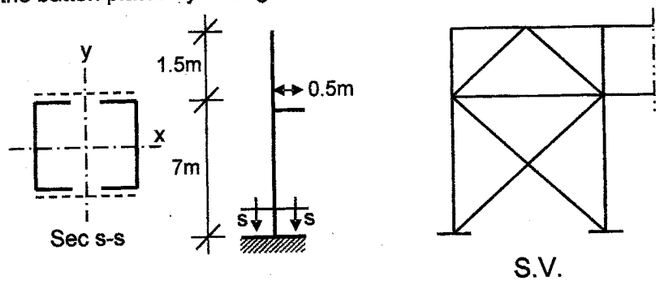


Fig. 2

Question (3) **(25 %)**

A fixed base connection is to be designed. The cross-section of the column is HEB 500. The column carries an axial load of $P_u = 35\,t$ in addition to a bending moment of $M_u = 15\,t.m$. The horizontal shear force at the base level is $5t$. The concrete cubic strength underneath the base plate is $f_{cu} = 300\ kg/cm^2$. It is required only to:

(a) Discuss the cases where the fixed bases are used. **(2.5 %)**
(b) Find the dimensions of the base plate. **(5 %)**
(c) Design the fillet welds connecting the column with the base plate. **(2.5 %)**
(d) Design the anchor bolts considering them made of ordinary steel St 37. Assume the anchor bolts of the compression side to bear all the shear force of the column. **(10 %)**
(e) Draw to scale 1:10 different views of the base, by assuming the dimensions of the stiffeners of the C-channels by avoiding their local distortion. **(5 %)**

Question (4) (15 %)

The connection shown below is subjected to ultimate bending moment of 20 t.m and ultimate shearing force of 8 t. Assume that the top flange connection resists (**only**) the tension force due to moment and the web connection resists (**only**) the shearing force. Determine **the number of M22 bolts** (N1 and N2) of high-strength friction type (category C according to ECP205) 10.9. Also, estimate **the thickness of the top cover plate.**

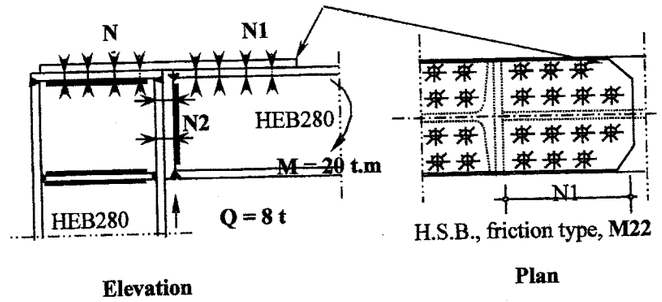


Fig. 3

Question (5) (15 %)

It is required to design a crane track girder (crane beam) as shown in Fig. 1 and Fig. 4. Use the following data:

- Span of the beam is 6.0 m and it is designed as simply support.
- Load on each of the crane wheel acting on the crane beam is 9.0 t.
- Distance between wheels (wheel base) = 2.2 m.
- Neglecting the effect of brake force.

Design aids:

- *Calculate the straining actions: Mx, My, Qx and Qy.*
- *For simplicity, choose **HEB** section and find the classification of the section.*
- *Calculate actual and allowable stresses.*
- *Check of shear.*
- *Check of deflection.*
- *Check of crippling.*

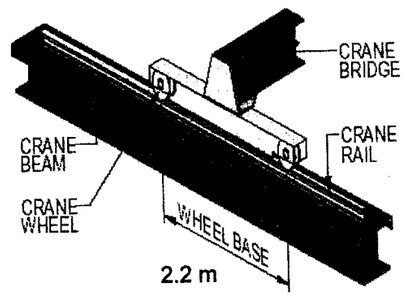


Fig. 4 Crane track girder

Question (6) (12 %)

(a) Draw the different types of composite columns; neat sketches should be appreciated. **(3 %)**

(b) It is required to design a concrete-filled square tubular column. The column is a hinged-hinged column with a height of 5 m. The design axial load of the column is 300t. The steel tube is formed of St 52 and the concrete cubic strength is $400\ kg/cm^2$. **(9 %)**

Question (7) (8 %)

A splice for a simple beam of 14 m span at a distance of 6m from the left support is to be designed. The beam carries an ultimate load of $w_u = 1.5\,t/m$. The compression flange of the beam is laterally supported at the supports and at each distance of $(2.2m)$. The cross-section of the beam is formed from HEB 600. Use bolts of Category (C) of Grade 8.8. The steel used is St 52. Use splice plates for the beam's web and flanges. It is required **only** to:

(a) Assume the thickness of the splice plates for both the web and flanges. **(3 %)**

(b) Find the number and the diameter of bolts for the splice plates for flanges only. **(5 %)**

Best wishes

Prof. Dr. M.A. Dabaon and Examining Committee

Code specifications (ASD) to solve Question (5)

- Tension and compression due to bending of compact sections symmetric about the plane of their minor axis and bent about their major axis:

$F_b = 0.64F_y$

- The member must meet the compact section requirements
- The lateral unsupported length of the compression flange is limited by the smaller of:

$$L_u \le \frac{20b_f}{\sqrt{F_y}}$$

$$L_u \le \frac{1380A_f C_b}{dF_y}$$

- *For other cases:*

$F_t = 0.58F_y$ For *tensile* stresses

The (f_{ltb}) may be calculated more accurately for *compressive* stresses as a resultant of:

$$f_{ltb} = \sqrt{(f_{ltb1})^2 + (f_{ltb2})^2} \le 0.58F_y$$

$$f_{ltb1} = \frac{800A_f}{L_u d} C_b \le 0.58F_y$$

$f_{ltb2} = 0.58F_y$ For $\left(\frac{L_u}{r_t}\right) < 84\sqrt{\frac{C_b}{F_y}}$

$$f_{ltb2} = \left(0.64 - \frac{(L_u / r_t)^2 F_y}{1.176 * 10^5 * C_b}\right) F_y \le 0.58F_y \quad \text{For } 84\sqrt{\frac{C_b}{F_y}} < \left(\frac{L_u}{r_t}\right) < 188\sqrt{\frac{C_b}{F_y}}$$

$$f_{ltb2} = \frac{12000}{(L_u / r_t)^2} C_b \le 0.58F_y \quad \text{For } \left(\frac{L_u}{r_t}\right) > 188\sqrt{\frac{C_b}{F_y}}$$

Tanta University
Faculty of Engineering
Structural Engineering Department
3rd year Civil Engineering

Foundations Engineering (1); CSE3214
Term Exam, June. 2016
Thursday; 16 / 6 / 2016
Allowable time: 3 hours

Answer all the following questions. (Exam mark =85)

For all the problems; consider F_{cu} is 250 kg/cm^2 and H.T.S 36/52.

Question No. (1) (10 point)

(a) Using clear sketch, show the critical section of moment for different types of wall footing **(2 point)**

(b) Discuss in details how to determine the stress distribution under an isolated footing subjected to vertical load and bending moment **(2 point)**

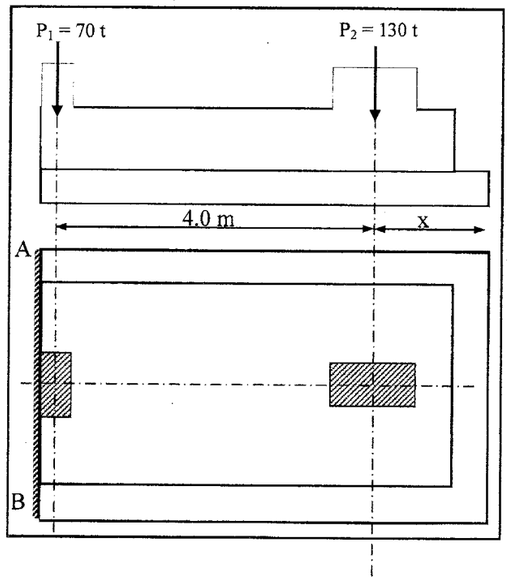
(c) Illustrate the procedures to design ribbed raft foundation. **(2 point)**

(d) Given the numbers of steel reinforcement in short direction of rectangular footing = 40 bar and the footing is (4.5 x 2.0) m, draw sectional elevation of the footing showing the bars distribution **(2 point)**

(e) Using clear sketch, show how to determine the transfer steel reinforcement for
(i) A strip footing with inverted beam (ii) A strip footing without inverted beam. **(2 point)**

Question No. (2) (20 point)

The figure shows the plan of two adjacent columns. The left column is (30 x 60) cm and carries 70.0 t and the right column is (40 x 80) cm and carries 130.0 t. The distance center to center of columns is 4.0 m and the allowable net soil pressure is 1.70 kg/cm^2. The thickness of plain concrete layer = 40 cm. Considering the projection of the plain concrete = 40 cm and the thickness of the R.C footing = 80 cm, you are required to:



(i) Determine the distance (x) required to give uniform stress distribution on soil **(5 point)**

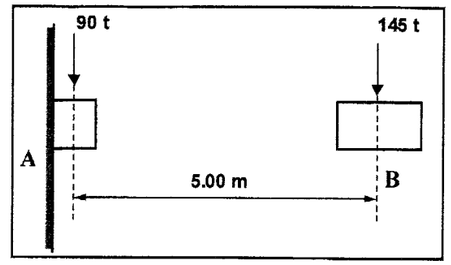
(ii) Check the shear stress adjacent to the left column **(5 point)**

(iii) Determine the maximum negative moment on the R.C combined footing = 80 **(5 point)**

(iv) Determine the reinforcement in the transfer direction under the right column **(5 point)**

Question No. (3) (13 point)

The figure shows the plan of two adjacent columns. The left column is (40 x 40) cm and carries 90 t and the right column is (40 x 80) cm and carries 145 ton. The allowable net bearing capacity of supporting soil =1.80 kg/cm^2. If the thickness of plain concrete layer = 20 cm, you are required to:



a) If a strap footing is used, design only the strap beam considering the eccentricity of the left footing = 0.80 m **(7 Point)**

b) If there is an obstructions preventing the projecting of the footings beyond the right columns, Determine only the dimensions of the trapezoidal footing and draw the contact pressure. **(6 Point)**

Question No. (4) (14 point)

(a) Using clear sketches define the negative skin friction for piles and illustrate its effect on pile capacity. **(3 point)**

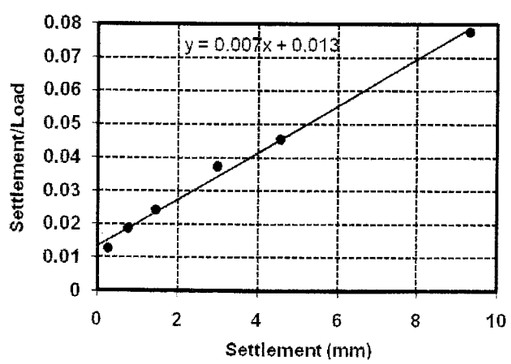
(b) The figure shows a pile load test results drawn according to modified Chin. The pile diameter is 50 cm and its length = 20 m. The Modulus of elasticity for pile material = 140 t/cm^2. Using the figure and tabulated results, you are required to

(i) Predict the load settlement relationship according to Brinch Hansen method. **(4 Point)**

(ii) Estimate the safe pile load using the predicted figure **(4 Point)**

(iii) Can you consider the test is successful? **(3 Point)**

Load, (tons)	0	20	40	60	80	100	120
Settlement , mm	0.0	0.26	0.75	1.46	2.98	4.55	9.31



Question No. (5) (11 point)

(a) Illustrate the different types of piles according to the installation method showing the advantages and disadvantages of each method. **(3 point)**

(b) A pile cap is subjected to column load of 300 ton. The column dimensions are 30 x 100 cm and the pile diameter = 60 cm. If the allowable pile load is 90 ton, you are required to:-

(i) Design the pile cap. **(5 point)**

(ii) Draw a neat sketch for plan reinforcement of this cap. **(3 point)**

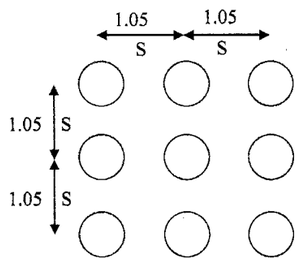
Question No. (6) (17 point)

(a) Discuss what is meant by group action and define the group efficiency illustrating how to estimate it **(2 point)**

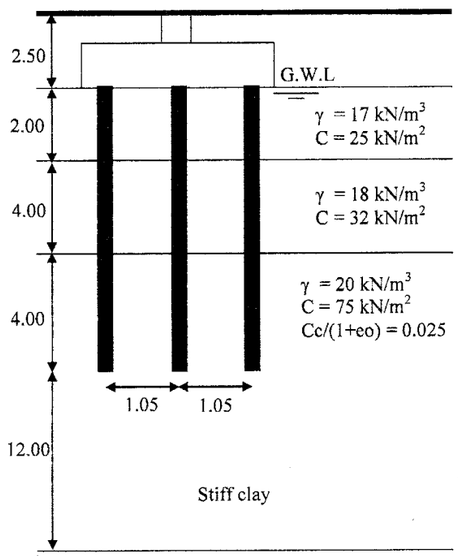
(b) The figure shows 9 piles group constructed in a clayey soil. The column load is 1100 kN and the pile diameter is 35 cm. You are required to:

(i) Estimate the expected settlement of this cap. **(3 point)**

(ii) Estimate the group efficiency. **(4 point)**

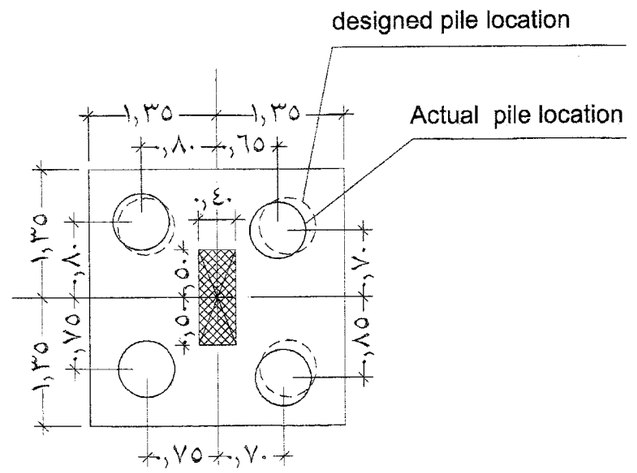


Plan of group

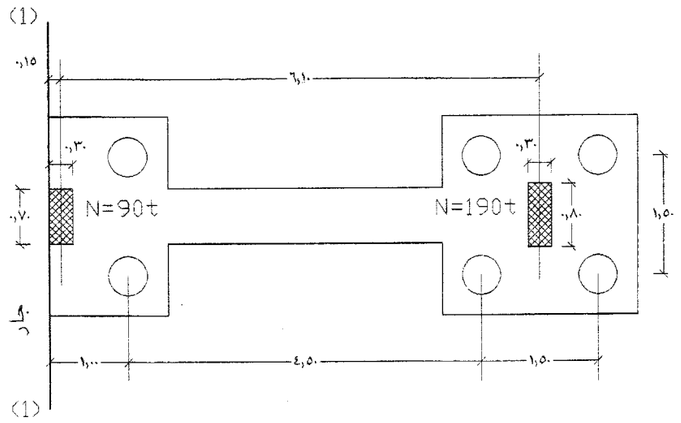


(c) For the shown pile cap, the column load is 280 ton, the safe pile load is 75 ton and the pile diameter is 50 cm.

Check the safety for this pile cap according to the actual piles location. **(5 point)**



(d) Draw <u>without any calculations</u> clear sketches of longitudinal section into the strap showing its reinforcement **(3 point)**



خالص الأمنيات بالتوفيق والنجاح

أ.د. مصطفى الصواف — أ.د. أشـــرف نظـــير

٢٠١٦/١/٩

TANTA UNIVERSITY

FACULTY OF ENGINEERING

Department of Irrigation and Hydraulics Engineering
Examination 3RD Year Students of Civil Engineering

Course Title: **Design of Irrigation Works (1)**		Course Code: **CIH3206**	
Date: **9 – 06 – 2015**	Term: **Second 2015/2016**	Total Assessment Marks: **100**	Time Allowed: **4 Hours**

Notes: - *Systematic arrangement of calculations and clear neat drawings are essential.*
- *Any data not given is to be reasonably assumed.*
- الإمتحان مكون من أربعة أسئلة فى ثلاثة صفحات بالإضافة الى جداول تصميم قطاعات الخرسانة.
- غير مسموح باصطحاب أى جداول أومنحنيات.

Question No. 1 (25 Marks)

A. ***Suggest*** *the suitable hydraulic structures for the following crossing:* **(4 Marks)**

1. *A canal and a railway.*
2. *Two navigable canals.*
3. *A navigable canal and a railway.*
4. *A main drain and a bigger main canal.*

B. ***Distinguish*** *(giving the selection reasons) between the different* ***alternative works****, which can be used for the crossing of* ***Road – Canal****.* **(4 Marks)**

C. *Using neat sketches,* ***briefly explain*** *how you can choose the* ***optimum number of Bridge vents.*** **(4 Marks)**

D. *It is required to design a* ***circular well*** *type* ***tail-escape*** *(the weir and the orifice only) to discharge* ***25%*** *of the maximum canal discharge into the adjacent drain. The length of the last reach of the canal is* ***3.2 km*** *and the emptying time is* ***36 hrs****. The canal* ***maximum*** *discharge is* ***2 m^3/sec****. the canal and drain cross-sections are given in* ***Figure 1****.* **(8 Marks)**

E. *Using a neat* ***sketch****, draw a* ***Sec. – Elev.*** *of the* ***circular tail-escape*** *of the previous problem showing all elements.* **(5 Marks)**

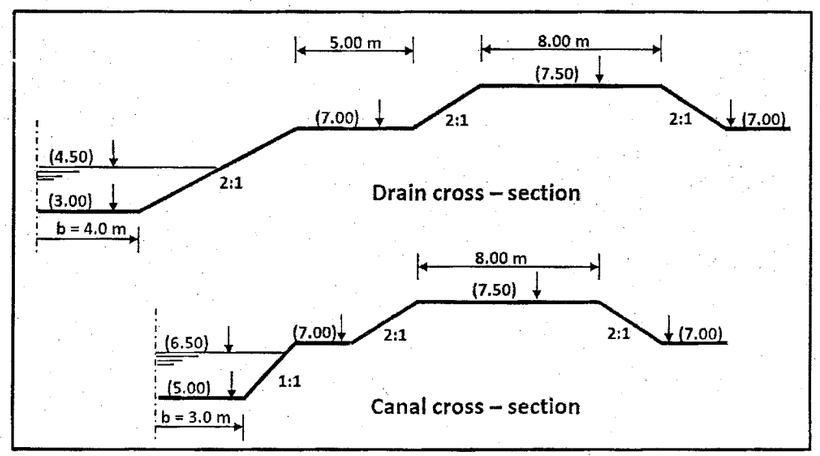


Figure 1

Question No. 2 (25 Marks)

A ***RC slab bridge*** *is to be constructed across the shown main canal in Figure (2). The canal maximum passing discharge is* ***25*** *m^3/sec. The bridge consists of* ***two vents****, each is* ***3.5 m span****. The crossing road is* ***8 m*** *width, its top finished level is* ***(19.00)*** *and its side slopes are* ***1:1****.*

- *The bridge deck total width is* ***8 m; 6 m*** *for the deck and 2 sidewalks of* ***1 m*** *each.*
- ***RC*** *pier of* ***1 m*** *width is used.*
- *The US and DS used wing walls are* ***RC box*** *and* ***broken*** *walls, respectively.*
- *The soil properties at the bridge site are:* $\varphi = 30^o$, $\gamma_{bulk} = 1.8$ t/m^3, $\gamma_{sat} = 2$ t/m^3 *and the soil bearing capacity is* ***1.63*** *kg/cm^2.*
- *For* ***RC*** *elements,* ***steel (36/52)*** *and* ***concrete (F_{cu} = 250 kg/cm^2)*** *are used.*

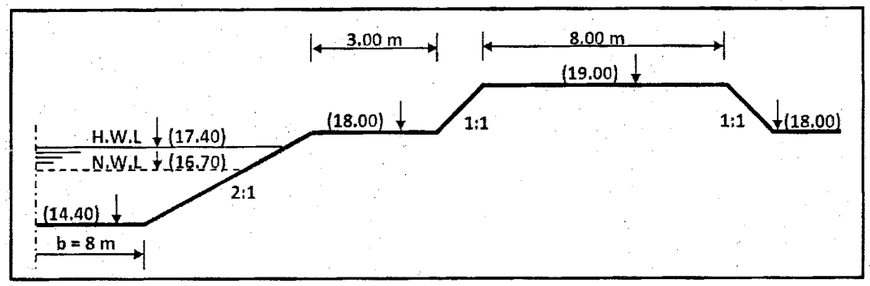


Figure 2

It is required to:

1. Check the hydraulic design. **(4 Marks)**
2. **Give** the suitable RFT of the **slab (t_s= 0.4 m).** **(6 Marks)**
3. **Check** the soil bearing capacity under the pier for the case of **maximum eccentricity**. **(6 Marks)**
4. **Give** the suitable RFT of the pier for the case of **maximum eccentricity**. **(4 Marks)**
5. **Draw,** *using neat sketches, the* ***reinforcement details*** *of the* ***RC slab*** *in the* ***main direction****.* **(5 Marks)**

Question No. 3 (30 Marks)

A. *For the shown canal and drain cross-sections in* ***Figure 1, a one vent RC box syphon*** *will be constructed to pass the discharge of the shown drain under the canal.*

- *The* ***maximum drain discharge*** *is* ***3 m^3/sec****.*
- *The* ***internal dimensions of the box*** *are* ***1.40*** *m X* ***1.40*** *m and its* ***thickness*** *is* ***30*** *cm.*
- *The distance between the canal bed and the syphon surface is* ***0.5 m****.*
- *No* ***reduction*** *in the bed of the drain is allowed.*
- *The US and DS used wing walls are* ***broken*** *wing walls.*
- *The soil properties at the syphon site are:* $\varphi = 30^o$, $\gamma_{bulk} = 1.8$ t/m^3, $\gamma_{sat} = 2$ t/m^3 *and the soil bearing capacity is* ***1.7*** *kg/cm^2.*

It is required to:

1. **Check** the syphon hydraulic design. (K_r =0.1 , K_{Bend} =0, **a**=0.003 & **b** = 0.031) **(4** Marks)
2. **Give** the complete structural design of the syphon (for L.L., consider the greater of an equivalent L.L of **2.1** t/m^2 or **60-tonn** Truck). **(14** Marks)
3. Draw, using a neat sketch, the **reinforcement details** of the syphon cross-section. **(2** Marks)

B. *For the shown canal and drain cross-sections in **Figure 1, a one steel pipe aqueduct** will be constructed to pass the discharge of the shown canal over the drain. The pipe internal diameter is **1.40 m** and its thickness is **1.2 cm**.*

It is required to:

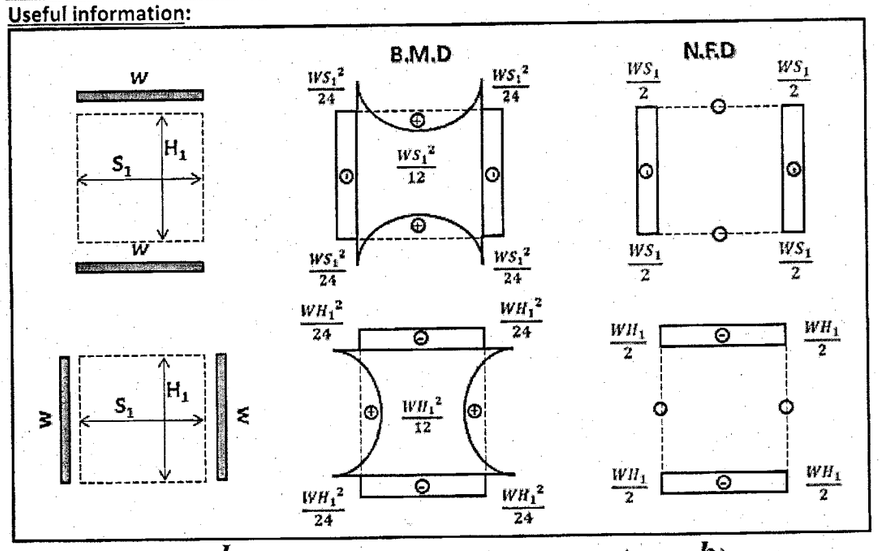
1. **Check** the pipe thickness if only **two** supports are allowed to be used in the drain. **(6** Marks)
2. **Check** the soil bearing capacity under the supports if the supports are **PC piers** (its width is **1.0 m**) and the allowable bearing capacity of the soil is **1.1** ***kg/cm^2***. **(4** Marks)

Question No. 4 (20 Marks)

A. **Draw,** into a scale of **1:100, a plan (H.E.R.) and a Sec. Elev.** for the **bridge** layout of the **Question No. (2),** showing all levels and dimensions. **(12** Marks)

B. **Draw,** into a scale of **1:100, a Sec. Elev.** for the **syphon of the problem (A) in Question No. (3),** showing all levels and dimensions. **(8** Marks)

Useful information:



$$K_f = f \times \left(\frac{L}{4R}\right) \quad for\ box\ culvert\ f = a\left(1 + \frac{b}{R}\right)$$

Tables of RC cross sections design [Working Stresses Design Method]

Allowable working stresses for concrete (kg/cm^2)

Characteristic strength	F_{cu}	150	175	200	225	250	275	300
Axial Compression	f_{co}	40	45	50	55	60	65	70
Beams (binding)	f_c	65	70	80	90	95	100	105
Shear (beams without RFT)	q_c	5	5	6	6	7	7	7

Allowable working stresses for steel types

Steel type	Mild steel 24/35	Steel 28/45	Steel 36/52	Steel 40/60
f_s (kg/cm^2)	1400	1600	2000	2200

Table of K_1 & K_2 for f_s = 2000 kg/cm^2

f_c	α = 0.0		α = 0.2		α = 0.4		α = 0.6		α = 0.8		α = 1.00	
	k_1	k_2	k_1	k_2	k_1	k_2	k_1	k_2	k_1	k_2	k_1	k_2
20	.897	1913	.896	1912	.891	1912	.888	1911	.885	1910	.882	1909
25	.731	1894	.726	1893	.722	1891	.717	1890	.712	1889	.707	1888
30	.621	1877	.615	1876	.609	1874	.602	1873	.596	1871	.590	1869
35	.542	1862	.536	1860	.529	1859	.521	1857	.514	1855	.507	1853
40	.484	1846	.476	1845	.468	1843	.460	1841	.451	1840	.443	1835
45	.438	1832	.429	1831	.421	1829	.411	1828	.402	1827	.392	1826
50	.401	1818	.389	1816	.382	1817	.372	1815	.362	1815	.351	1814
55	.371	1806	.361	1806	.350	1805	.339	1805	.329	1805	.317	1805
60	.347	1793	.335	1793	.325	1794	.312	1794	.300	1794	.288	1795
65	.324	1782	.313	1783	.302	1784	.289	1785	.277	1787	.264	1788
70	.306	1771	.294	1773	.282	1775	.269	1777	.256	1779	.242	1782
75	.289	1761	.277	1763	.265	1766	.251	1769	.237	1773	.222	1776
80	.276	1750	.263	1754	.250	1759	.236	1763	.221	1767	.205	1772
85	.263	1740	.250	1748	.236	1751	.222	1753	.206	1762	.189	1768
90	.250	1731	.239	1738	.226	1745	.209	1752	.193	1759	.175	1766
95	.243	1722	.229	1730	.214	1739	.198	1747	.181	1755	.162	1765
100	.233	1715	.219	1724	.205	1735	.188	1744	.170	1753	.150	1763

For Simple Bending : $d = k_1\sqrt{\frac{M}{b}}$, $A_s = \frac{M}{k_2 \cdot d}$; N_K

Table of steel bars

Φ mm	weight kg/m	Area of Cross-Section in cm^2									
		1	2	3	4	5	6	7	8	9	10
6	.222	.283	.566	.848	1.13	1.41	1.70	1.98	2.26	2.54	2.83
8	.395	.503	1.01	1.51	2.01	2.51	3.02	3.52	4.02	4.52	5.03
10	.617	.785	1.57	2.36	3.14	3.93	4.71	5.50	6.28	7.07	7.85
13	1.04	1.33	2.66	3.98	5.31	6.64	7.96	9.29	10.6	11.9	13.3
16	1.58	2.01	4.02	6.03	8.04	10.1	12.1	14.1	16.1	18.1	20.1
19	2.23	2.835	5.67	8.50	11.3	14.2	17.0	19.9	22.7	25.5	28.4
22	2.98	3.80	7.60	11.4	15.2	19.0	22.8	26.6	30.4	34.2	38.0
25	3.85	4.91	9.82	14.7	19.6	24.5	29.5	34.4	39.3	44.2	49.1
28	4.83	6.16	12.3	18.5	24.6	30.8	37.0	43.1	49.3	55.4	61.6
32	6.31	8.04	16.1	24.1	32.2	40.2	48.3	56.3	64.3	72.4	80.4
38	8.90	11.3	22.6	33.9	45.2	56.5	67.8	79.1	90.4	102	113

TANTA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF STRUCTURAL ENGINEERING مدني وإنشاءات لاحة جديدة
EXAMINATION (THIRD YEAR) STUDENTS OF CIVIL AND STRUCTURAL ENGINEERING
COURSE TITLE: DESIGN OF REINFORCED CONCRETE STRUCTURES (2) b

DATE: JUNE – 2016	TERM: SECOND	TOTAL ASSESSMENT MARKS: 75	COURSE CODE: CSE3210/3223
			TIME ALLOWED: 4 HOURS

For all problems consider that: f_{cu}=30MPa, St.400/600

Systematic arrangement of calculations and clear neat drawings are essential. Any data not given is to be assumed – Answer as many questions as you can

الإمتحان مكون من ٣ أسئلة فى صفحتين

PROBLEM # ONE (22marks) **TRY ALL PROBLEMS**

A. Fig. (1-a) shows different frames under the given loads. It is required (**without any calculations**) to sketch the B.M.D and the corresponding main tension steel. **(6marks)**

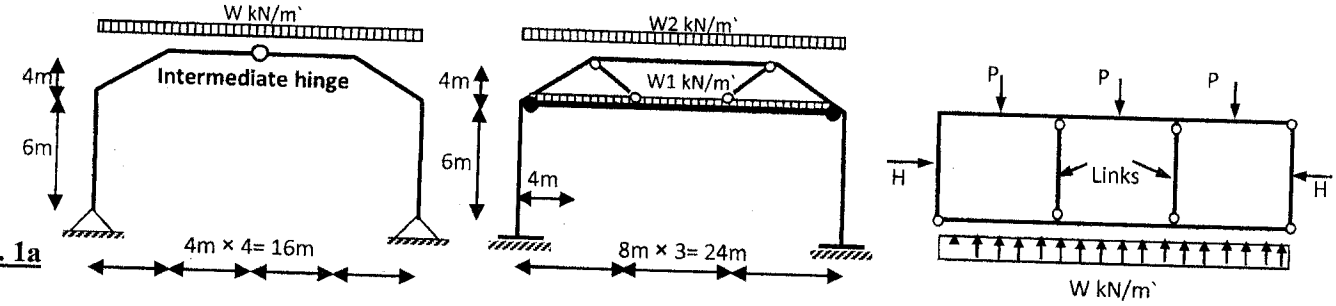


Fig. 1a

B. Fig. (1-b) shows statically determinate frame **ABCDEFGHIJ** of a series frames spaced 5m. The statical system, ultimate loads and concrete dimensions of an intermediate frame is shown in the figure. The frame is hinged at **A** and **B** and two intermediate hinge at **E** and **F** acting as strut **EF** and a link member **IJ**. The vertical component reactions at A and B are equal (**YA = YB**) and the force in the link member **IJ** is compression and equal **235kN**. It is required to make a complete design one of the intermediate frame having breadth 400mm and slab thickness 120mm. Neglect the effect of buckling in out of plane of the frame. For the given factorized (ultimate) loads, determining the following:

i- Draw the B.M., S.F. and N.F. diagrams. **(6marks)**
ii- Design the critical sections and check shear stresses of the frame. **(5marks)**
iii- Draw to reasonable scale the intermediate frame showing clearly the concrete dimensions and the reinforcement details in elevation and in cross sections. **(5marks)**

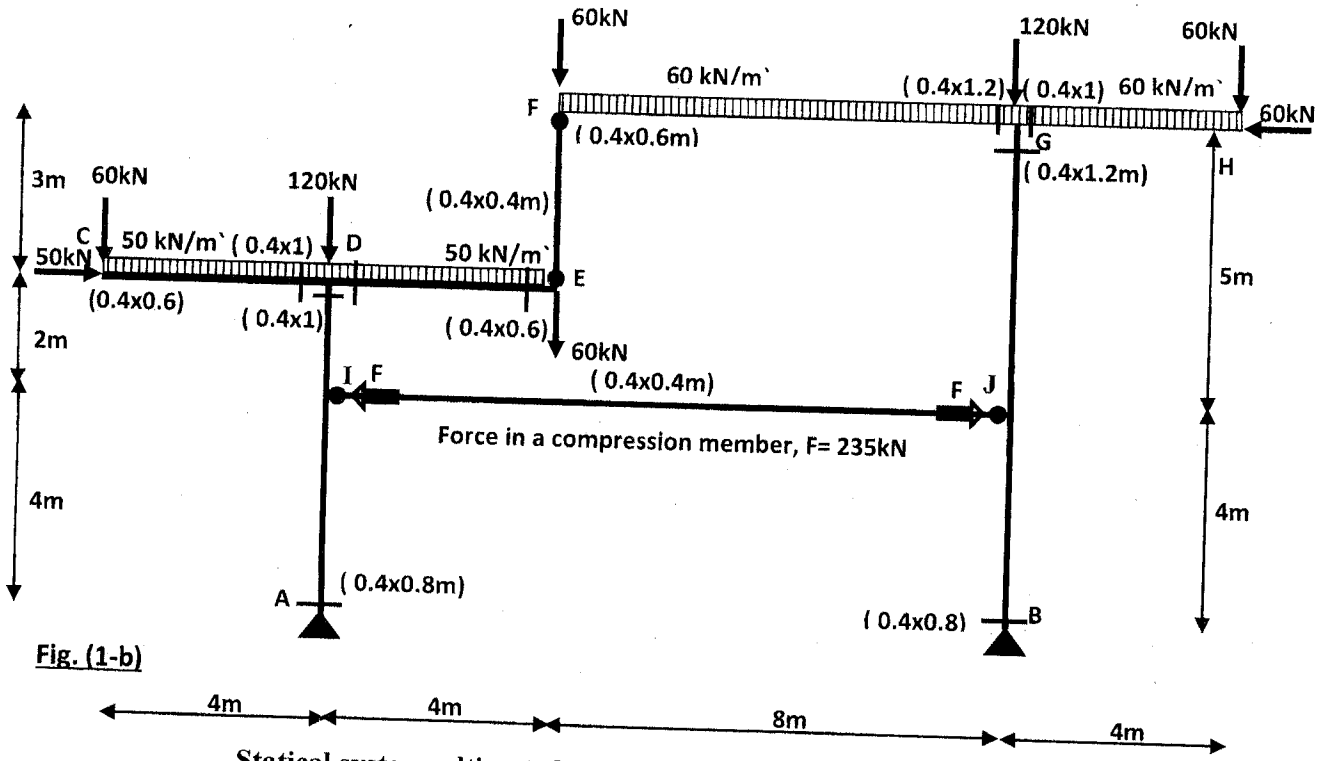


Fig. (1-b)

Statical system, ultimate loads and concrete dimensions

PROBLEM # TWO (39marks)

A. i. What will happen for case of equal arched slab thickness? **(1marks)**
ii. Illustrate the functions of necessary braced beams used in a triangular shed using sketches. **(1mark)**

P.T.O ⟶

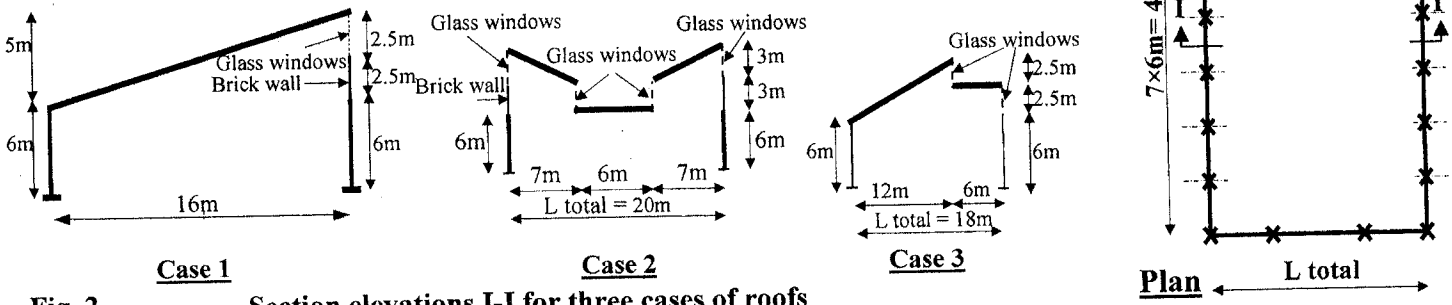
ii. What are the differences between ties and effective spans for each of the arched slab and arched girder? **(1marks)**

iii. Explain effect of the horizontal reaction on analysis of the arches. **(2marks)**

B. Fig. 2 shows plan and sectional elevations of an industrial hall (L×42m). The columns are allowed only in the outer perimeter of the hall. There are **three cases** of roofs may be used to covering this hall as shown in the sectional elevation I-I. It is required to carry out the following:

i. Suggest the **more economic** main supporting elements "MSE" that carry the given roofs and draw to convenient scale the sectional elevations, showing concrete dimensions of all necessary structural elements. Using diagrammatic sketches, **illustrate** the loads transfer up to the footings **for each case**. **(18marks)**

ii. **For the roof of case 2 only: design** the critical sections of the chosen **MSE** and its main elements, if the **average ultimate total loads** on the MSE are **20kN/m²**. The own weight of MSE may be estimated. **Draw** to convenient scale the sectional elevation of MSE showing reinforcement details of all designed elements. **(7marks)**



Case 1 Case 2 Case 3

Fig. 2 **Section elevations I-I for three cases of roofs**

C. An Arched slab with a tie of span 18m and rise 3m supported on columns of spacing, **S= 5m.** The following data are given: ultimate stiffener load, $w_{u,stif}$= **7kN/m`**, total ultimate load of a tie, $T_{total,u}$= **650kN**, ultimate **own weight** of the vertical and horizontal beams= **12kN/m`**, Ultimate moment of arched slab at quarter point= **7kN.m.** It is required to determine the maximum dead and live loads carried by the arch. Design the tie and the arch at crown. Determine the total loads applied on the column. **(9marks)**

PROBLEM # THREE (24marks)

A. Fig. 3 shows a Vierendeel girder of span 30m. B.M.D of a V. G is given. It is required to carry out the following: Draw S.F. and N.F. diagrams of the V.G and find the applied load P. Without any calculations draw the shape of the transverse reinforcement for the joint (**A**). Define the different factors affecting the behavior of beam-column joints. Define with neat sketches the different modes of failure for beam-column joints. **(8marks)**

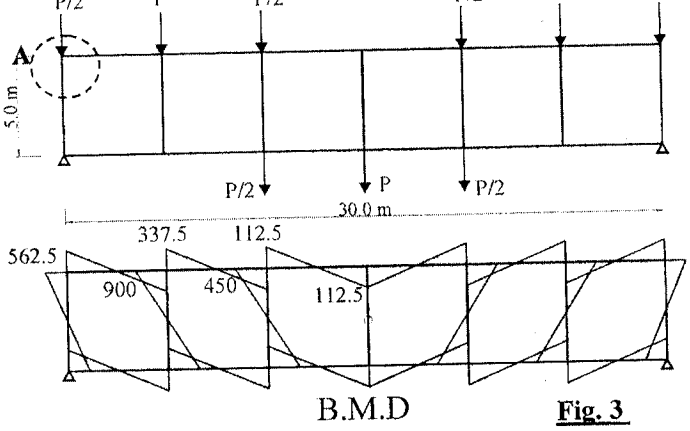
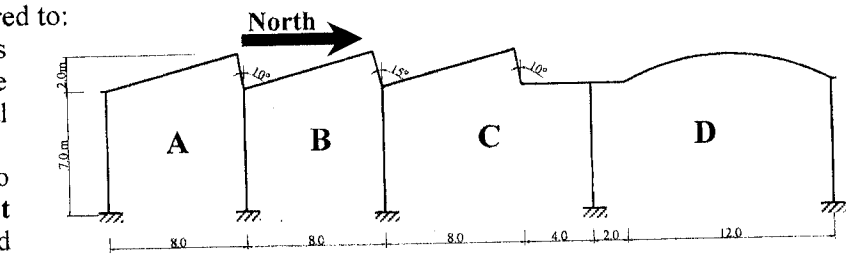


Fig. 3

B. Fig. 4 shows layout of a plan and sectional elevation of an industrial hall of dimensions 16 × 42m. The hall consists of three panels **A, B, C** and **D**. A **north light roof slab** is required for panels A, B and C, whereas the arch roof is required in panel D. Columns are only allowed on the axes 1, 2 and 3 when marked ■ in plan. It is required to:

i- Suggest the suitable main supporting elements needed to carry the roofs. Draw to reasonable scale sectional elevation showing all necessary structural elements and its concrete dimensions. **(7marks)**

ii- Illustrates the load transfers from the roofs to foundations, using diagrammatic sketches **(without any calculations)**. Locate the foundation axes related to column axes and draw its reinforcement with the columns. **(9marks)**



Section Elevation I-I

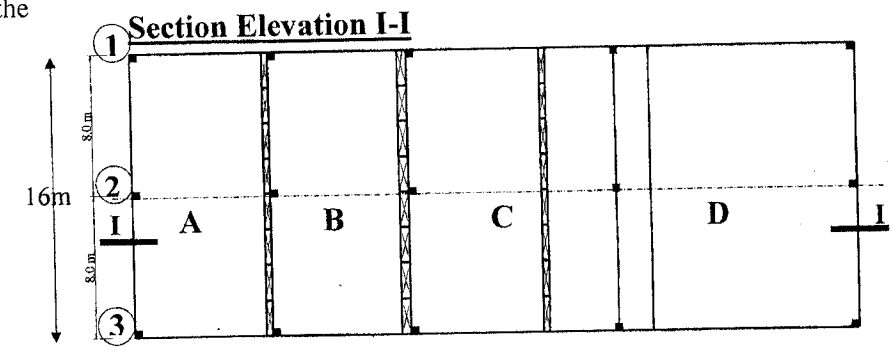


Fig. 4 **plan**

All the best

Prof. Mohamed Ahmed Kasem
Prof. Tarek Faawzy El-Shafiey
Assoc. Prof. Ahmed Mohamed Atta

Arrange your answer carefully --- Time allowed: 3 hours

Question (1) [7 marks]:

Select the suitable sub-stage and write it beside the appropriate action through project life cycle.

A. Conceptual Design	**c. Design Development**
B. Schematic Design	**d. Contract Documents**

1. Investigate different design solutions and systems.
2. Produce a detailed bill of quantities
3. Select the suitable project delivery system.
4. Project proceeding green light or red light.
5. Design the main project system and components
6. Present sponsor visions and aims for the project.
7. Present at least third of the design completion percentage

Question (2) [18 marks]:

1. **Plot only** a graph illustrating the different types of construction contract forms.
2. **Mention** two alternative names for both Competitive bidding and Negotiated cost plus contracts types.
3. **List** the cases when using the cost reimbursable contracts is suitable. And differentiate between both advantages and disadvantages of this type of contracts.
4. **List** the main factors that affect the choice of the correct type of contract.
5. **Differentiate** between "Target cost with variable fees" and "Cost plus incentive fee" contracts.
6. **Briefly interpret** what you know about the FIDIC contract from the lecture.

Question (3) [20 marks]:

1. **List only** the contents of construction project documents issued for procurement.
2. **Differentiate** between: (1) General and supplementary conditions of a contract, (2) Performance bond and bid bond.
3. **Mention only** the purpose of the Estimating process and what exact actions are conducted in this process, and plot a chart showing the chronological order of this process.
4. **Define only**: (1) Tender adjustment process, and what is the outcome of this process. (2) Submitting Tender and contents of the two envelopes.
5. For the following project, Given that the **price factor** is 1.30
   1. **Calculate the tender price** and
   2. **Show** how both balanced bid and unbalanced bid can result.

Item	Unit	Quantity	Direct cost			
			Material LE/m3	Equipment LE/m3	Labor LE/m3	S/C
1	m^3	150	1000	11200	4000	-
2	m^3	180	1800	1000	4000	-
3	m^3	40	960	400	3200	-
4	m^3	60	1200	600	4800	-
5	L.S.	job	-	-	-	2000

أمنياتنا الطيبة لكم بالتوفيق ،،،،،

Question (4) [20 marks]:

The following data are for a running project in the end of week 7. The original schedule can be determined using in Table 1. While the updated schedule can be determined using Table 2 (using the end of period concept). Also, actual weekly costs have been recorded in Table 3.

Table 1

Activity	Pred.	Duration (weeks)	Budget
A	---	2	30,000
B	---	4	40,000
C	A	4	20,000
D	B	3	24,000
E	C,D	5	50,000
F	C,D	2	40,000
G	E,F	2	8,000

Table 2

Activity	Start date	Finish date
A	0	3
B	1	5
C	3	8
D	5	9
E	9	14
F	9	11
G	14	16

Table 3

Week	1.	2	3	4	5	6	7
Actual Cost	25,000	20,000	15,000	13,000	13,000	14,000	8,000

- It is required to plot the curves of "**BCWS**" and "**ACWP**" only.
- Comment on the **progress** (cost and time) of the project on the updating date (week 7).

Question (5) [20 marks]:

Develop a resource schedule for a small project using data below. Consider resource constraints as stated in the end of the following table.

Act.	Duration (days)	Pred.	Resource Rates			Act.	Duration (days)	Pred.	Resource Rates		
			R1	R2	R3				R1	R2	R3
A	5	--	0	0	0	**G**	10	C	2	2	2
B	5	--	1	1	1	**H**	10	D	0	0	2
C	10	--	1	2	2	**I**	5	E,F	1	1	1
D	10	--	2	2	2	**J**	5	G,H	0	1	2
E	5	A	0	0	0	**K**	10	I	1	1	4
F	5	B	2	2	2	**L**	10	J	1	2	3
R1 ≤ 2			**R2 ≤ 4**			**R3 ≤ 6**					

(End of Exam)

Examiners Committee; *Dr. Haytham Sanad and Dr. Mohamed Ali A. Hakam*

أمنياتنا الطيبة لكم بالتوفيق ،،،،،

Tanta University — Civil Engineering Department — Faculty of Engineering

Total Marks: 70 Marks

Course Title: Railways Engineering	Course Code:CPW3204	Year: 3rd
Date: 5th June 2016	Allowed Time: 3 hrs	No of Pages: (2)

Remarks: (Answer all the following questions, assume any missing data), (Answers should be supported by sketches)

اجب عن جميع الاسئلة مع العناية بالرسومات والنظام وفرض اي بيانات تجدها لازمة.... الاسئلة في ورقتين

السؤال الاول (15 درجة)

1. اذكر العوامل التي تتوقف عليها مقاومة السير والهواء واهم الطرق لحسابها والفروق بينها .
2. عند تصميم خط سكة حديد مفرد لنقل خام الحديد من مناطق استخراجه في الواحات البحرية الي المصانع في حلوان فرض الانحدار الحاكم في الاتجاه من حلوان الي الواحات 7‰ والانحدار الحاكم من الواحات الي حلوان 1‰ فاذا كانت اقصي سرعة مصرح بها في الاتجاهين هي 40 كم / الساعة ووزن العربات الفارغة 1000 طن ووزن الخام الصافي في القطار الواحد 2000 طن فالمطلوب حساب قدرة قاطرة الديزل اللازمة لجر مثل هذه القطارات اذا كان طراز القاطرات المستخدمة جـ -جـ ووزنها 132 طنا وملحق بالقطار سبنسة وزنها 18 طن. استعمل معادلات ستراهل لحساب مقاومة السير والهواء (Δ س = 12) واذا اريد ايقاف القطار من سرعته القصوي وهو محمل فاحسب مسافة وزمن الرباط اذا كان انحدار الخط في هذا الجزء هابط ومقداره 5‰ مع العلم ان جميع محاور القطار مزودة بفرامل (افرض ان وزن العربة الفارغ = 20 طن) . تحقق كذلك اذا ما كانت القاطرة تستطيع جر القطار السابق اذا ما اضطر الي التوقف علي الانحدار الحاكم في كلا الاتجاهين

السؤال الثاني (20 درجة):-

1. علل الاتي:- في خطوط السكك الحديدية المنحنية تتلاشي العجلة المركزية الخارجية عند وقوف القطار في حين تظهر العجلة المركزية الداخلية عند بدء الحركة
2. تم اختيار ثلاث مسارات مختلفة لخط سكة حديد تربط بين مدينتين محددتين لنقل خام الفوسفات والمطلوب اختيار المسار الافضل اقتصاديا اذا علم ان :

الخط الاول طوله 9 كم وتكاليف انشاء الكيلومتر الواحد مليون جنيه وعليه منحنيان احدهما طوله 900 متر بنصف قطر 500 متر والاخر طوله 1200 متر بنصف قطر 800 متر والانحدار الصاعد عليه يساوي 2‰ لمسافة 3 كم

الخط الثاني طوله 8 كم وتكاليف انشاء الكيلومتر الواحد مليون و 200 الف جنيه ويوجد عليه منحني طوله 1300 متر بنصف قطر 900 متر والانحدار الصاعد عليه يساوي 5‰ لمسافة كيلومتر واحد

الخط الثالث طوله 10 كم وتكاليف انشاء الكيلومتر الواحد 750 الف جنيه ويوجد عليه منحني طوله 600 متر بنصف قطر 500 متر والانحدار الصاعد عليه يساوي 3‰ لمسافة 1,5 كم.

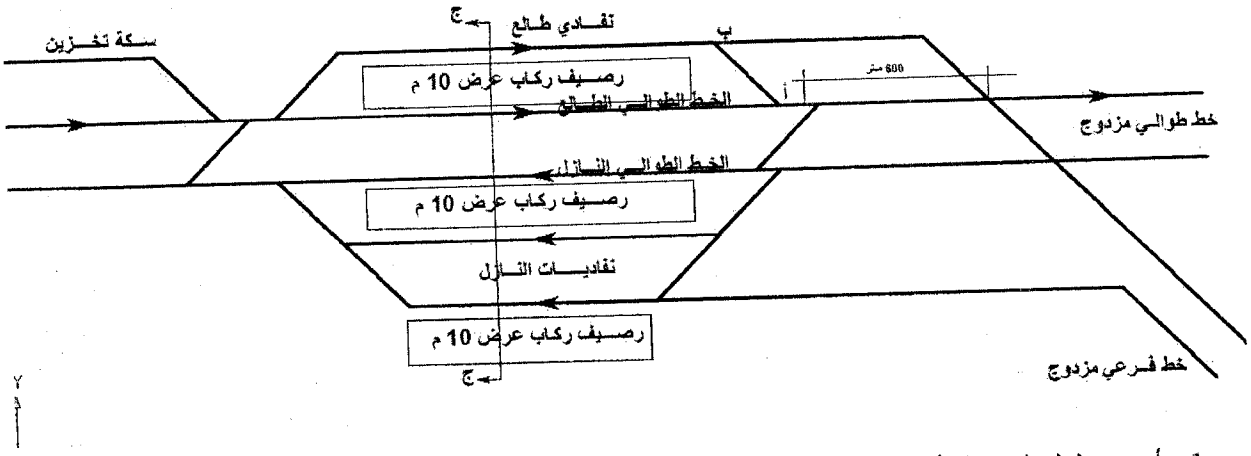
علما بان نفقات الجر تساوي 30 الف جنيه سنويا للكيلومتر الطولي من الخط الافقي المستقيم وبفرض أن جميع قطارات نقل الخام متساوية في الوزن وان مقاومة السير والهواء علي الخط تساوي 2,8 كجم للطن وان استخراج خام الفوسفات من هذه المنطقة سوف يستمر لمدة عشرين عاما

3. خط سكة حديد مترو يقع عليه المنحنيات الأفقية التالية $ر_1$ = 800 متر , $ر_2$ = 1200 متر , $ر_3$ = 500 متر تسير عليه القطارات بسرعة قصوي 80 كم/ س والمطلوب ايجاد أطوال المنحنيات الانتقالية لكل منحني أفقي و جدول احداثيات توقيع هذه المنحنيات ثم ارسم المسقط الافقي والقطاع الطولي لأحد هذه المنحنيات ثم احسب العجلة المركزية و درجة المسير علي كل منحني قبل وبعد تنفيذ ارتفاع الظهر عن البطن.

السؤال الثالث (15 درجة):-

1. ماهي العوامل التي يعتمد عليها تحديدالاجهادات بالفلنكات.
2. سكة ذات اتساع واسع 1675 مم يسير عليها قطار ركاب سرعته 120 كم/س تجره قاطرة ديزل كهربائي طراز أ1أ- أ1أ فاذا كان وزن القاطرة يتحدد بحيث ان لا يزيد الاجهاد في الفلنكات عن 80 كجم / سم^2 وان لا يتجاوز الضغط في قطاع التزليط 1,0 كجم/سم^2 . فاوجد وزن القاطرة اذا كانت القضبان موضوعة علي وسائد طولها 30 سم والفلنكات خشبية مقاسها 265×25×15 سم بتقسيط 60 سم عمق قطاع التزليط = 50 سم. استعمل معادلات تالبوت المعدلة .

السؤال الرابع (20 درجة):-



1. أحسب طول التفريعة (أب) من نقطة أ سن ابرة المفتاح المساير علي الخط الطوالي الطالع الي نقطة ب سن ابرة المفتاح المقابل علي النفادي الطالع كما هو موضح بالرسم اذا علم ان طول الابرة 5,00 متر و قدو كعبها 160 مم وطول الجزء المستقيم قبل التقاطع 1,50 متر وزاوية المفتاح 1: 10
2. أوجد أقصي عدد من القطارات يمكن أن تخدمها المحطة السابقة في نفس الوقت و بين أنواع هذه القطارات
3. أحسب أبعاد أرصفة المحطة السابقة اذا علم ان طول عربات القطار 300 متر و طول القاطرة 25 متر وعدد ركاب القطار 1200 راكب
4. وقع الاشارات الاساسية والثانوية وأوجد أبعاد أكشاك البلوك علي المحطة السابقة

قوانين هامة

م س+هـ قاطرة = (250/و) * ((س+Δس)/100)^2

م س+هـ عربة= 2,5 + (س+Δس)^2/ ك

μ= ((9000/ (42+س)) +116)/1000

(ل ف) = (4,2 (و + ق)(س ق ^{2} - س ب ^{2})) / ق ف

ق ف = (و + ق)(م س+هـ متوسطة ± م ح + م م) + 1000 η (و ف + ق غ ف) ef*

ن ف = (ن + 0,03 (و+ ق)*(س ق-س ب))/((و + ق)/1000*(م س+هـ متوسطة ± م ح + م م) + η (و ف + ق غ ف) ef*

ض =((122- ص)/ 56)*(ض/ط)*(α+ جا α جتا β2)

ض = (52,8 ض/ ص ^{1,25})*(10) $^{-6,13 *(س/2ص)^{2,5}}$

س$_1$ =(ط/4)((μ)/(EI4)) $^{1/4}$ سم

ع$^/$ = 0,318 و س$_1$ كجم. سم

ص$^/$ = (0,393 و)/ (μ س$_1$) سم

مع خالص تمنياتي بالنجاح والتوفيق..... د. رجاء عبد الحكيم ولجنة الممتحنين