Menoufia University
Faculty of Engineering
Shebin El-Kom
Final Exam
Academic Year: 2014-2015

Department: Civil Eng.
Year: 4th Civil
Metal. Const. CVE 423
Time Allowed: 4 hours
Date: 26/5/2014

Allowed Tables and Charts: ***Tables of Steel Sections, Egyptian Code of Practice (ECOP)***
This exam measures ILOS No: (a4.1, a4.2, a13.1, a13.2, a14.2, b13.1, b15.1, d3.1)

- Drawings should be neat, detailed and fully dimensioned.
- Any missing data may be reasonably assumed.

Answer all the following questions **[100 Marks]**

QUESTION (I) [60 Marks]

The main girders of a roadway pony bridge shown in Figure (1) are two welded plate girders, each having **32.0 m** span divided into **8** equal panels **4.00 m** each. Height of the web of the main girder = **3.00 m**. The cross girders are welded plate girders, each with **14.0** m span and with web height = **1.30m**.

GIVEN

Total steel wt. on one main girder (including own wt) = 1.50 t / m (for one M.G.).
Equivalent L.L. (including impact) = 10 t/m' (For calculations of M.G only)
D.L. of (slab + cover) = 0.60 t / m^2.
Steel used: **St 44** Bolts = HSB **M22mm**
Welded cross section of Cross Girder: 2 Flanges **320 x 28** + Web plate **1300 x 12**.

REQUIRED

a. Draw to a scale 1:100 the bracing system required for the stability of the bridge. **[10 Marks]**
b. Design the required stringers for roadway standard loads **[5 Marks]**
c. Design the connection between the stringer and the cross girder **[5 Mark]**
d. Design the welded plate girder section of the **M.G.** **[15 Marks]**
e. Design the field splice of the cross girder, **0.75** m apart from the main girder **[10 Marks]**
f. Design the end stiffener of the main girder. **[10 Marks]**
g. Design and draw (two views scale 1:10) the roller bearing of the main girder. **[5 Marks]**

QUESTION (II) [40 Marks]

The main girders of a double track railway bridge are two double web welded warren trusses, each having **60.0 m** span divided into **12** equal panels **5.00 m** each, as shown in **Figure (2)** The height of the cross section is **6.0m**. Cross girders are welded plate girders spaced at **5.0 m**, and with **10.0 m** span and web height equals **1.20m.**

GIVEN

Total steel wt. of the bridge (including wt. of M.G.) = 3.5 t/m' (for one M.G.).
Steel used **: St 44** Bolts diameter = **M24 mm** Thickness of G.PL. = **14 mm**
Distance (b) between the two Gusset plates = **40.0** cm.
Maximum forces are: **U2 = 680** ton (Comp.) **D1 = 160** ton (Ten.)
D2 = 140 ton (Comp.), **U1= 640** ton (Comp.) **V= 90** ton (Comp.)

REQUIRED

a. Draw with scale 1:00, the bracing system required for the bridge (3-Views). **[10 Marks]**
b. Find and the acting load on each bracing system and design the end diagonals of the bracing supported on the bearings. **[10 Marks]**
c. Design members **U1** and **D1** and choose a suitable section for member **D2** and **V**. **[20 Marks]**

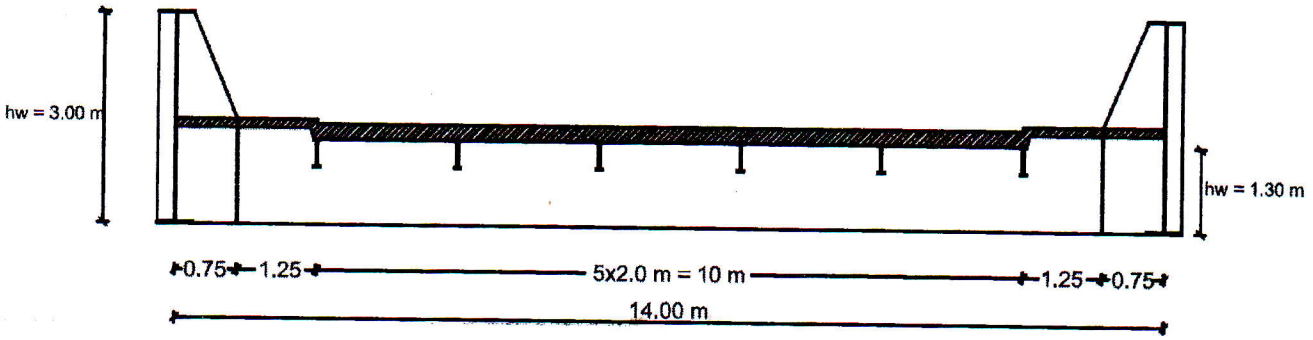
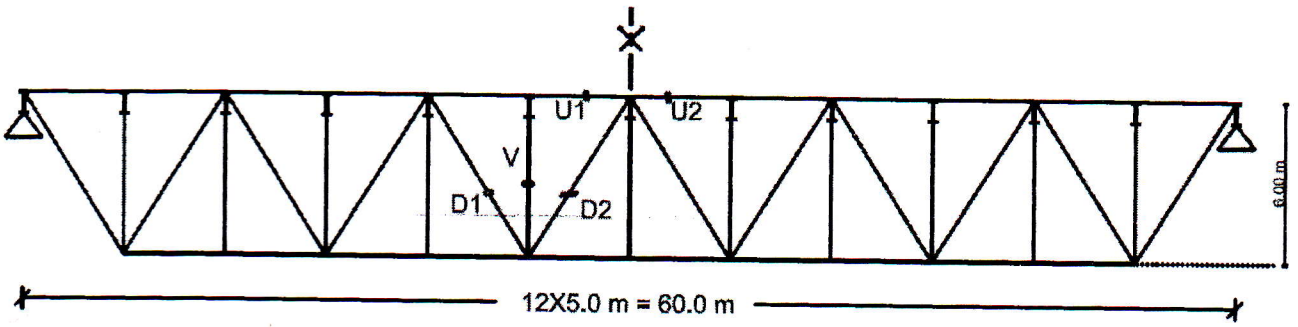
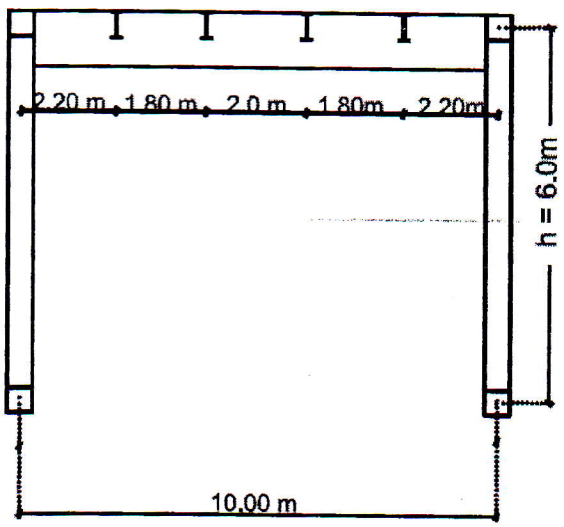
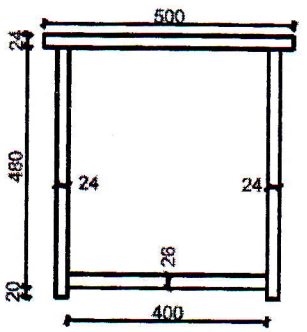


Figure (1)



Main Girder





Section of U2
Dimensions in mm

Figure (2)

With my best wishes,,,

Dr. Maher Elabd