Menoufia University
Faculty of Engineering
  Shebin El-Kom
Final Examination
Academic Year: 2013-2014

Department: Civil Eng.
Year: 4th Civil
Metal. Con. CVE 423
Time Allowed: 4 hours
Date: 3/6/2014

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 are two welded plate girders, each having **30.0 m** span divided into **6 equal panels 5.0 m** each. Height of the web of the main girder = **3.00 m**. The cross girders are welded plate girders, each with 10.0 m span and with web height = **1.20m**. The bridge is shown in Figure (1).

GIVEN

Total steel wt. on one main girder (including own wt) = 1.6 t / m (for one M.G.).
Equivalent L.L. (including impact)   = 9 t/m'/track (For calculations of M.G only)
Total D.L. (slab + cover) on side walk   = 0.50 t / m².
L.L. on side walk   = 0.50 t / m².
Steel used: **St 44**   Bolts diameter = 23 mm
Welded cross section of Cross Girder: 2 Flanges 300 x 30 + Web plate 1200 x 12.

REQUIRED

1. Draw a neat sketch for the bracing system required for the stability of the bridge. [**10 Marks**]
1. Design the required stringers for railway track   [**5 Marks**]
2. Design the connection between the stringer and the cross girder   [**5 Marks**]
3. Design the welded plate girder section of the M.G.   [**15 Marks**]
4. Design the field splice of the cross girder, 1.00 m apart from the main girder [**10 Marks**]
5. Design the end stiffener of the main girder.   [**10 Marks**]
6. 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 changes from **5.0m** up to **8.0 m** in the middle of the span . 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.) = 3.0 t/m' (for one M.G.).
Total D.L. (slab + cover) on side walk   = 0.50 t / m².
L.L. on side walk   = 0.50 t / m².
Steel used : St 44   Bolts   diameter = 25 mm   Thickness of G.PL. = 14 mm
Distance (b) between the two Gusset plates = 40.0 cm.
Maximum forces are: **U2 = 700** ton (comp.)   **D1 = 150** ton (comp.), **D2 = 130** ton (ten.),
              U1= 650 ton (comp.),   **V= 90** ton (ten.)

REQUIRED

1. Draw with scale 1:00, the bracing system required for the bridge (3-Views). [**10 Marks**]
2. Find the acting load on each bracing system and design the end diagonals of the bracing supported on the bearings.   [**10 Marks**]
3. Design members U1 and D1 and choose a suitable section for member D2 and V. [**15 Marks**]
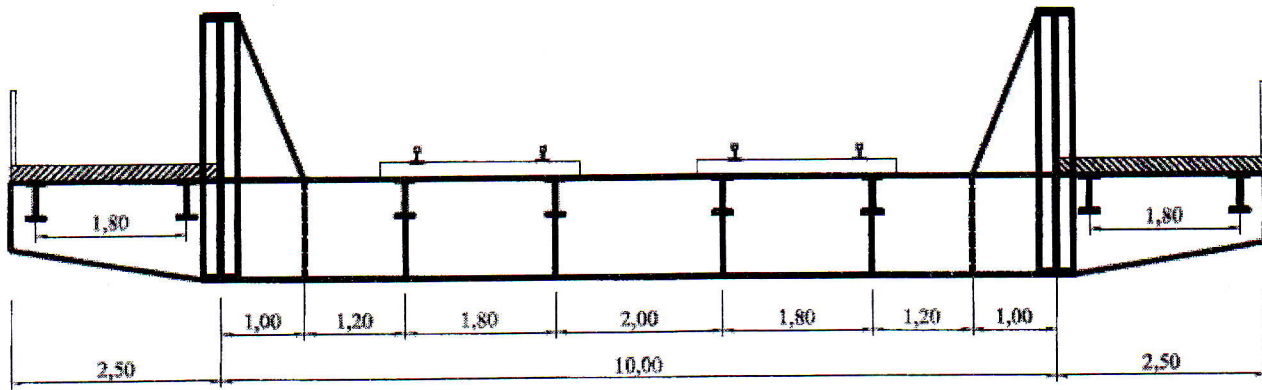4. Design connection (C).   [**5 Marks**]

Figure (1)

Main Girder
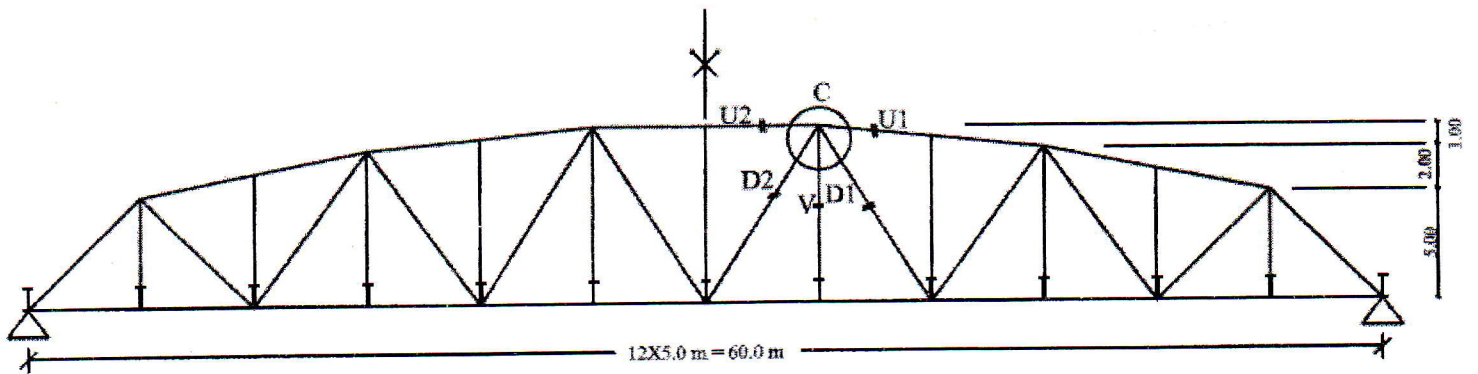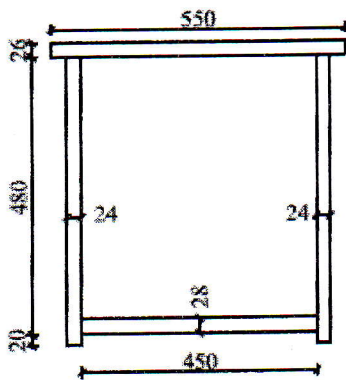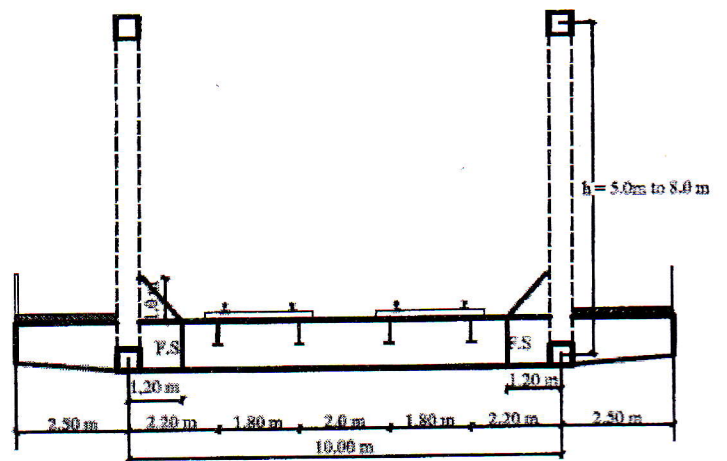

Section of U2
Dimensions in mm

Cross Section

Figure (2)

With my best wishes,,,

Dr. Maher Elabd