Kafr el sheikh University
Faculty of Engineering
Department of Civil Engineering
4th year, Steel Bridges
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Date: 23 - 05 - 2019
Time allowed: (3) hours
Full Mark: 75
Final Exam: 2 pages
Academic Number : CES4228

Notes: - Assume any missing data reasonably.
- Only steel tables and formula sheets are allowed.
- Unless otherwise noted, **steel used is St. 44**

1- The cross section of a double track railway bridge is shown in **Figure (1).** It has an open timber floor 4 stringers carrying the two tracks. The main girders are simply supported welded plate girders with a total span 22.50 ms which divided into 5 equal panels 4.50 ms each (spacing between cross girders 4.50 ms). The stringer bracing divide the stringers to two equal distances.

➢ The following data can be assumed
- Dead load of each track = 600 kg/m.
- Weight of the steel for one main girder = 2.00 t/m.
- Live load and wind load are according to Egyptian code requirements.

It is required to: (55 Marks)

a- Draw a general layout of the bridge (plan, and elevation only) showing the arrangement of all bracing systems. Use a scale of 1:200 (8 Marks , ILOS a.4)

b- Design a suitable rolled section (HEB) for the simply supported stringer. (10 Marks , ILOS a.13,b.15)

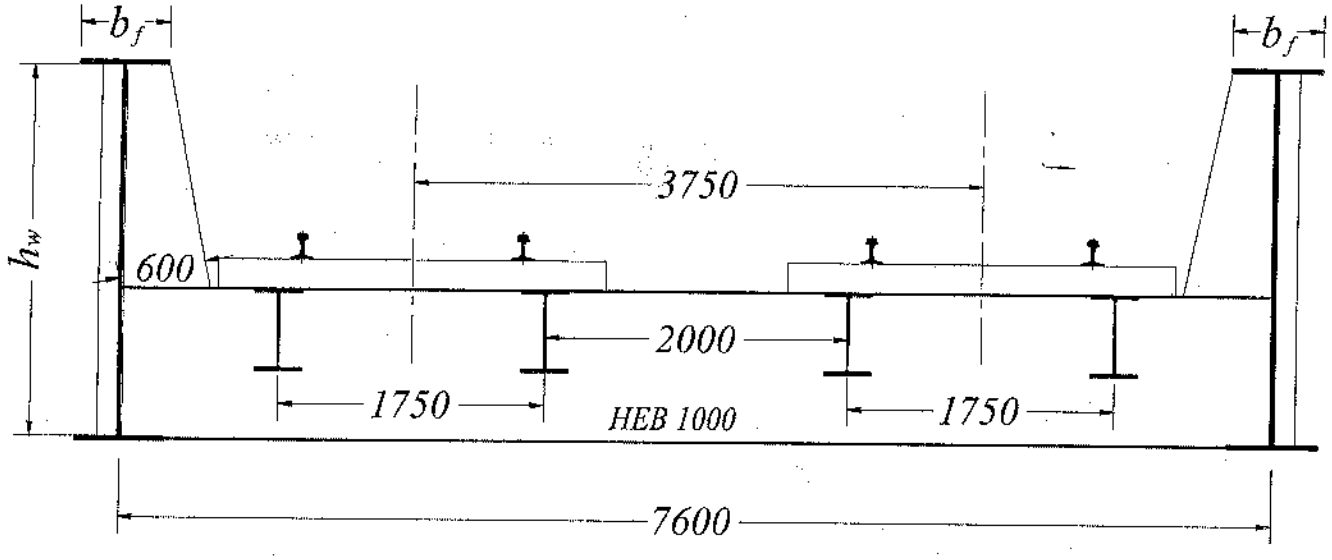
c- Design only the diagonal members of the stringer bracing. (4 Marks, ILOS a.13,b.15)

d- Determine only the loads acting in an intermediate cross girder (dead load, live load and its dynamic effect, and braking force). (5 Marks, ILOS a.13)

e- Give a full design for the main girders (h_w = 260 cm, b_f = 60 cm) by the flange area method (use horizontal stiffener at 1/4 h_w and vertical stiffeners at each cross girder only). Check the stresses, fatigue and deflection. (18 Marks, ILOS a.6, a.13, b.15, c.10)

f- Design a suitable section for the end vertical stiffener and the longitudinal stiffener. (6 Marks , ILOS a.6, a.13)

g- Design a bolted field splice for the plate girder if the actual shear force at the splice location equal to 100 ton. Use H.S.B M24 grade 10.9. (6 Marks, ILOS a.6, a.13, c.10)



Cross section

Figure 1

2- The main girders of a roadway through bridge are trusses as shown in **Figure (2).** The bridge has a span of 40.0 ms and is divided to 8 equal panels 5.0 ms each.

It is required to: **(22 Marks)**

a- Find the straining actions acting on an intermediate stringer. **(6 Marks , ILOS a.13)**

b- Calculate the maximum bending moment in an intermediate cross girder due to live loads only.

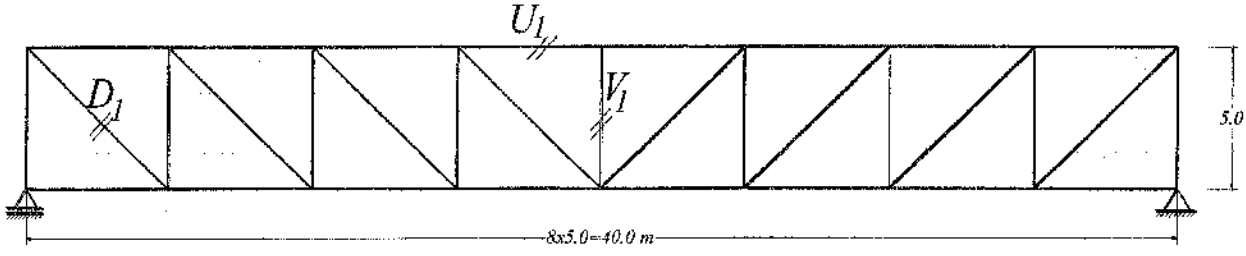
(6 Marks , ILOS a.13)

c- Design the marked members in the truss if the design forces in these members are :

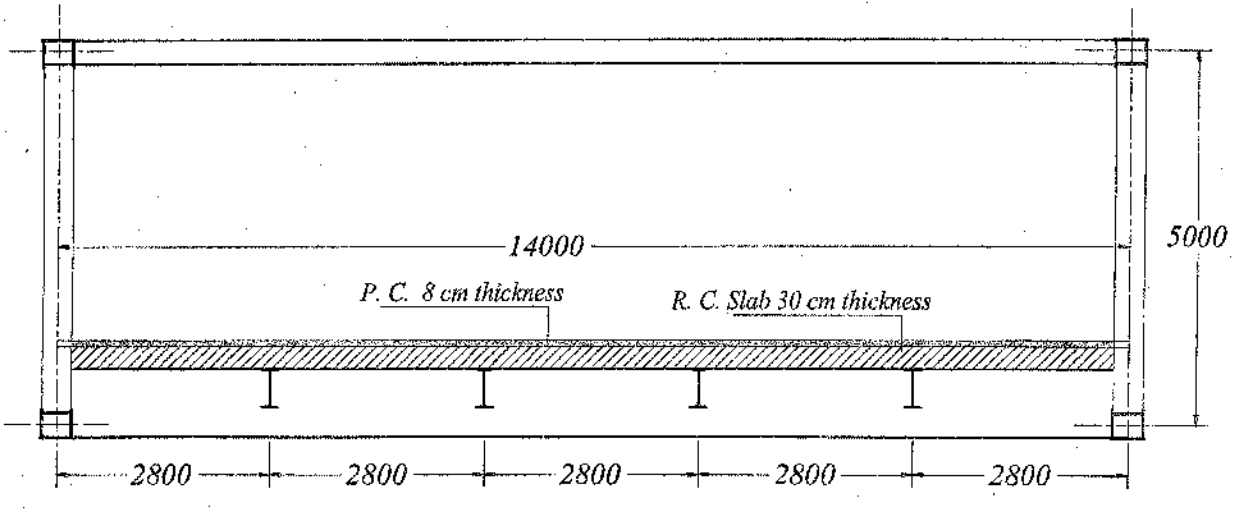
(11 Marks , ILOS a.13, b.15)

Member	U_1	D_1	V_1
$F_{max.}$	-480 ton	+260	zero
$F_{min.}$	-150 ton	+80	zero

- Take the distance between the two gusset plates equal to 32 cm (b = 32 cm). Assume the bolts used in the connection are M24.



a. Main girder



b. Cross section

Figure 2

Best Wishes: Dr. Magdy Israel M. I. Salama