University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2010/2011

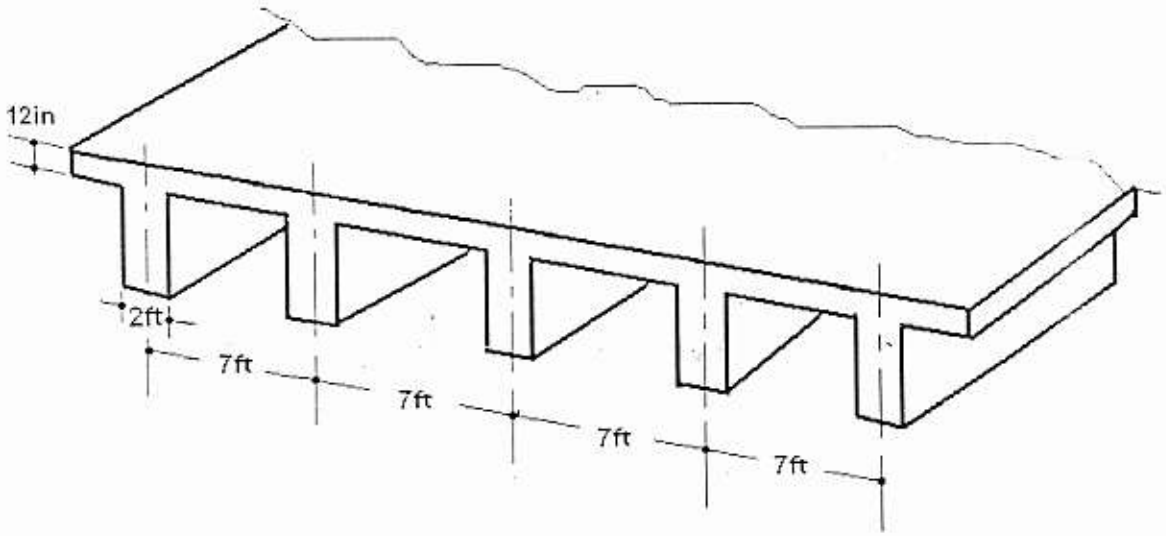
Branch :Highways& Bridges Engineering Class:4
Subject: Design of rein. concrete bridges Time : 3 Hours
Examiner: Assist. Prof. Alaa Al-Khateeb Date : 02/ 06/ 2011

Open books and notes exam. Answer 4 questions only.
Start each answer with a new page and follow the Questions sequence.

Q1: In the table below, match each bridge type with the proper site requirement.

1	Reinforced concrete slab Br.	Intermediate span with heavy loading Br.	
2	Reinforced concrete Deck-Girder Br.	Wide river with hard soil bed Br.	
3	Pre-cast pre-Stressed concrete Br.	15m long span single Br.	
4	Suspension Br.	Repetitive similar bridges	
5	Cable stayed Br.	Low grade Br. with marine movements	
6	Bascule Br.	Two ways marine movement Br.	
7	Swing Br.	Small river between two rocky sides Br.	
8	Steel truss Br.	Very wide and deep valley Br.	
9	Arch Br.	Short span Bridge	
10	Box cross section Br.	Long reinforced concrete deck slab Br.	

Q2: Under the HS20 AASHTO loading, design the required main reinforcement of one of the interior girders of the deck- girder bridge shown below. Use $f'_c = 6000$ psi and $f_y = 60000$ psi. Clear span = 35 ft. Wearing surface weight = 30psf.



Q3: Under the HS20 AASHTO loading, design (deck slab thickness, main reinforcement and secondary reinforcement) a two way slab bridge having a clear span of 12ft. Use $f'_c = 4000$ psi and $f_y = 50000$ psi.

Q4: Redesign the same bridge in question 3 but under the Standard vehicle class 100. Draw your final design.

Q5: The pretensioned flanged girder with a constant eccentricity tendon as shown in the Figure below has the following properties:

L=28m, y_t=221mm, y_b=693mm, A_c=4.43*10^5, I=3.11*10^{10}mm^4, e=588mm, w_g=3.6 kN/m, w_D=1 kN/m, w_L=2.4 kN/m, tendon force immediately after transfer P_i=1100 kN, R=82%, f'_{ci}=35MPa, f'_c=42MPa, calculate:

1-Girder stresses at supports and midspan for the top and bottom fiber immediately after transfer and check with ACI-Code permissible values.

2-Girder stresses at supports and midspan for the top and bottom fiber at service load stage and check with ACI-Code permissible values.