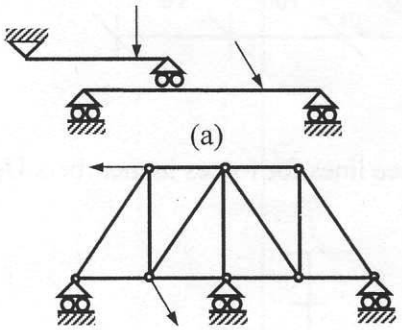
University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2012

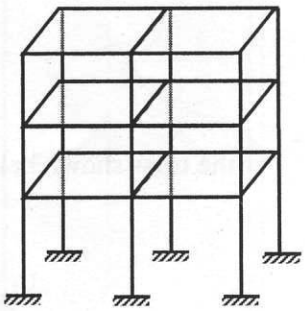
Course Title: Structural Analysis & Design I — Course Code: CE 311
Time: 3.00 Hours — Full Marks: 100 (=10×10)

*There are **fourteen (14)** questions in this paper. Answer any **ten (10)**.*
Assume any missing data reasonably.

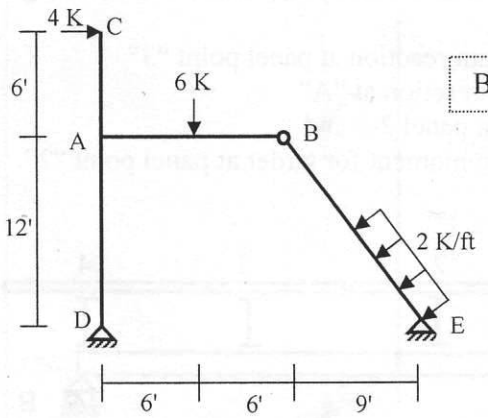
1. Classify each of the structures shown below as statically determinate or statically indeterminate, stable or unstable. If statically indeterminate, report the number of degrees of indeterminacy.


(a)

(b)

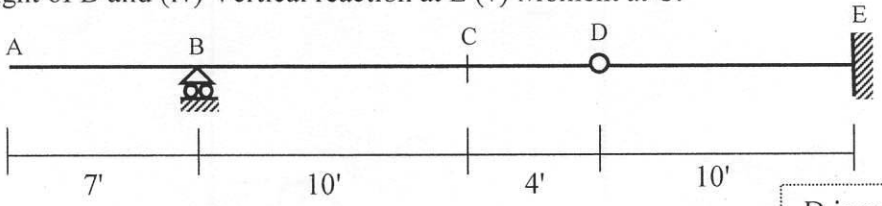

(c)

2. For the frame given below:
a) Determine the degree of statical indeterminacy (dosi)
b) Draw the axial force, shear force and bending moment diagram for AB and BE part of the frame.



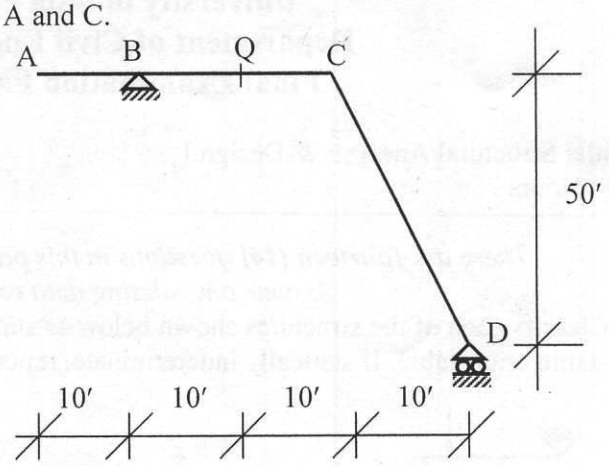
B is an internal hinge

3. For the beam shown below, draw Influence lines for (i) Reaction at B, (ii) Shear at C, (iii) Shear just right of B and (iv) Vertical reaction at E (v) Moment at C.

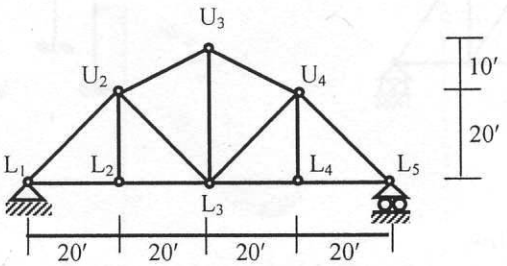


D is an internal hinge

4. Draw the influence lines for shear force and bending moment at Q of the frame shown in the figure. Load moves between A and C.

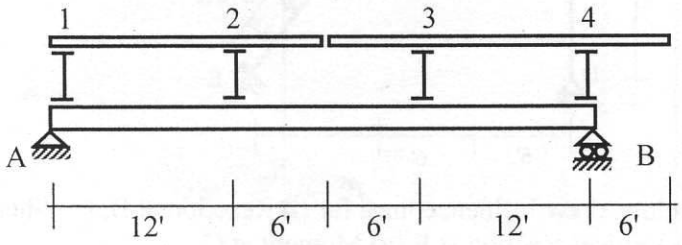


5. For the truss shown below, draw the influence lines for forces in members U_2U_3, U_2L_3 and L_2L_3

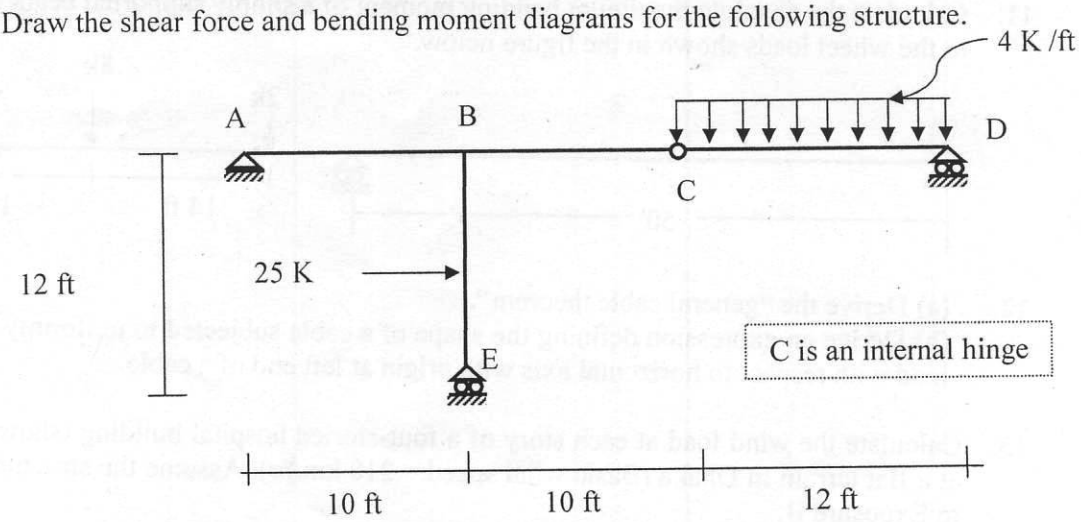


6. Girder AB supports a floor system as shown in the figure below. Draw the Influence line for

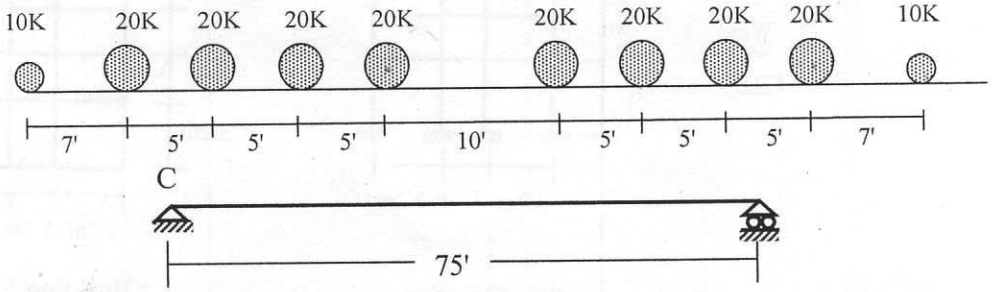
(i) Floor beam reaction at panel point "3"
(ii) Support reaction at "A"
(iii) Shear in panel 2-3 and
(iv) Bending moment for girder at panel point "2".



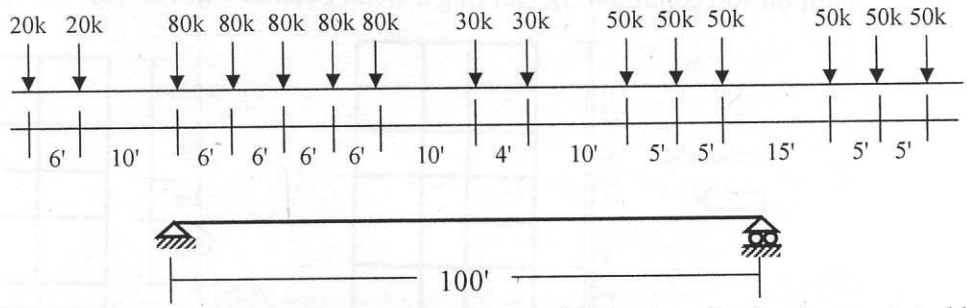
7. Draw the shear force and bending moment diagrams for the following structure.



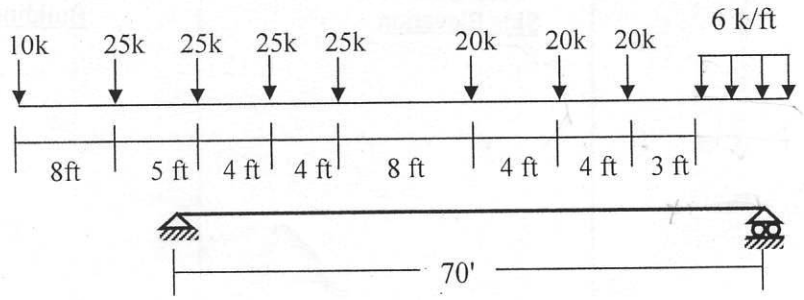
8. Calculate the maximum reaction at support C of a deck girder due to the loads as shown in the figure below



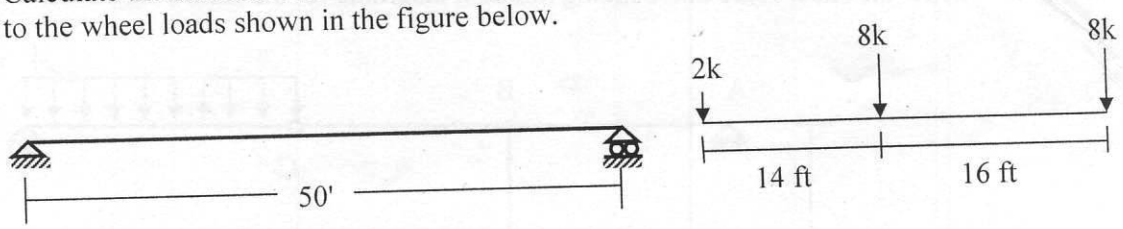
9. Calculate the maximum live load shear at the quarter point from the left support of a simply supported beam of span 100 ft due to the axle loads of a heavy freight locomotive shown below.



10. Calculate the maximum bending moment at the one-third point of a simply supported beam of span 70 ft due to the wheel loads shown in the figure below.

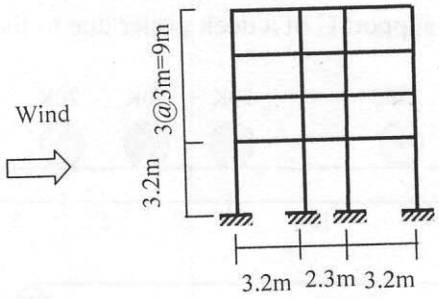


11. Calculate the absolute maximum bending moment of a simply supported beam of span 50 ft due to the wheel loads shown in the figure below.

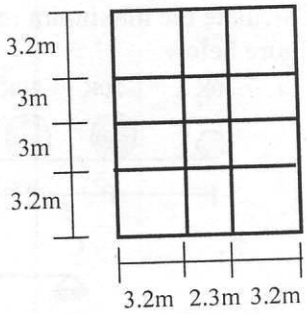


12. (a) Derive the "general cable theorem".
(b) Derive an expression defining the shape of a cable subjected to uniformly distributed load with respect to horizontal axis with origin at left end of a cable.

13. Calculate the wind load at each story of a four-storied hospital building (shown below) located at a flat terrain in Dhaka (Basic wind speed = 210 km/hr). Assume the structure to be subjected to Exposure B.

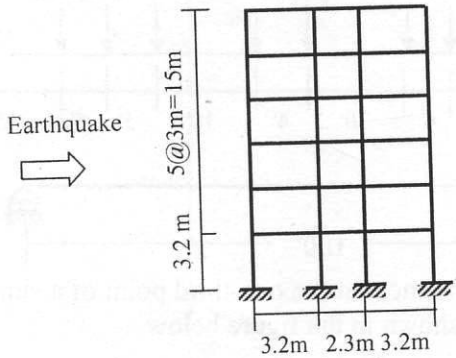


Side Elevation

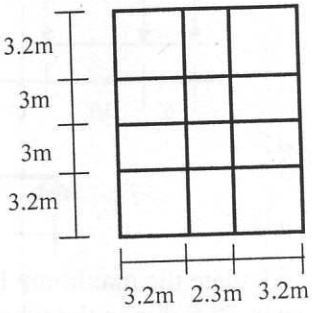


Building Plan

14. Calculate the seismic load at each story of a six-storied hospital building (shown below) located in Dhaka (Zone 2). Assume the structure to be an Ordinary Moment Resisting Frame (OMRF) built on soil condition S_2, carrying a Dead Load of 9 kN/m^2 (Including partition load).



Side Elevation



Building Plan