



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

Subject : Theory of Structures  
Branch : Highway & Bridges Eng.  
Examiner : Dr. Qays Abdul Mageed

Class: 3<sup>rd</sup> year  
Time : 3 Hours  
Date : 04 /06/2011



**Note: Answer Four Questions Only**

Q1- A) For the structure shown in Fig. (1-A), use the *Consistent Deformation* method to find the force in member (BC) due to a rise in temperature of (30°C), noting that (EA=10<sup>4</sup> kN) and ( $\alpha = 12 \times 10^{-6} / ^\circ\text{C}$ ).

(13 marks)

B) For the structure shown in Fig. (1-B), discuss stability and determinacy of the structure then use *Approximate Analysis* to draw the (BMD) for all beams and columns.

(12 marks)

Q2) For the structure shown in Fig. (2), use the *Slope Deflection* method to find the end moments; write the equilibrium and shear equations needed in their final forms with respect to rotation and displacement without solving them.

(25 marks)

Q3-A) Prove that the vertical deflection at the free end of the cantilever arch shown in Fig. (3-A) is  $\left( \frac{\pi P r^3}{4 EI} \right)$ .

(10 marks)

B) For the simply supported beam shown in Fig. (3-B), find:

- 1) Maximum moment at midspan due to the load shown.
- 2) Absolute maximum moment due to the same loading shown.

(15 marks)

Q4) Using the *Moment Distribution* method, analyze the frame shown in Fig. (4) to find the end moments. (EI=10<sup>4</sup> kN.m<sup>2</sup>)

(25 marks)

Q5) For the structure shown in Fig. (5), do the following:

- A) Find the maximum reaction at (3) due to a uniformly distributed load of (5 kN/m), 2m long.

(10 marks)

- B) Draw influence line for link (DF).

(15 marks)



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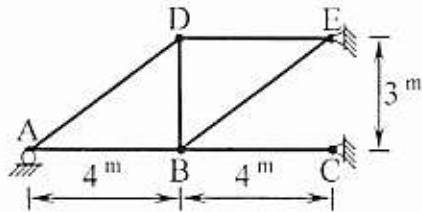


Fig. (1-A)

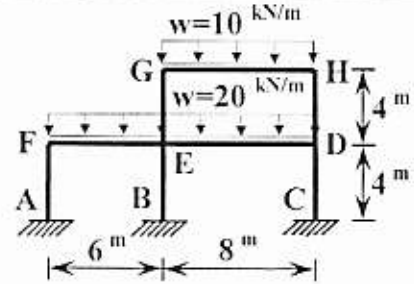


Fig. (1-B)

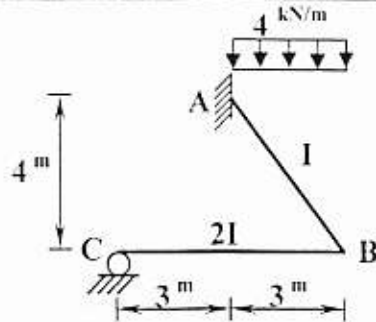


Fig. (2)

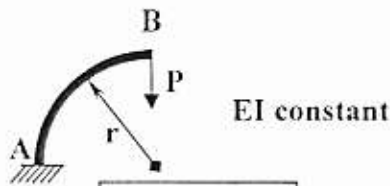


Fig. (3-A)

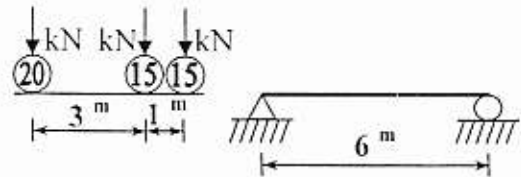


Fig. (3-B)

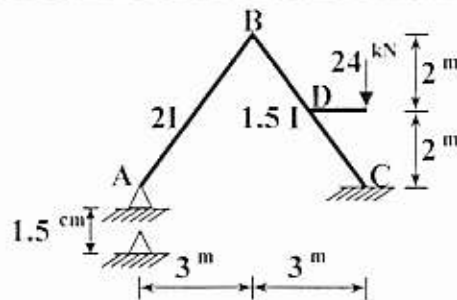
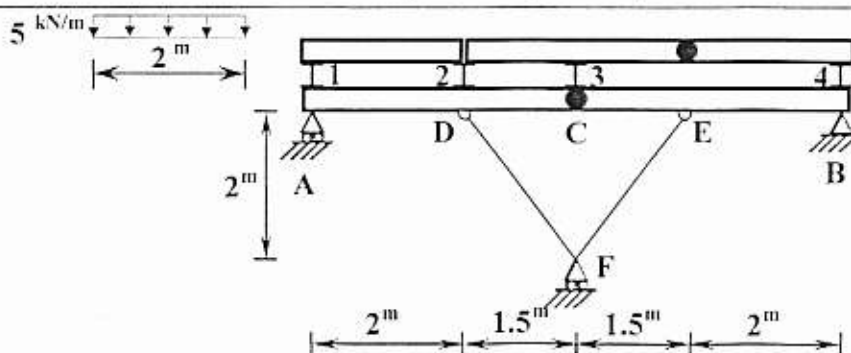


Fig. (4)



● Internal Hinge

Fig. (5)