

CE-222 STRUCTURAL ANALYSIS I
DEPARTMENT OF CIVIL ENGINEERING
Quiz 1; February 10, 2020, 9-10pm

Problems carry equal weightage

Problem 1

Draw the **Axial Force**, **Shear Force** and **Bending Moment Diagrams** for the frame *ABCDE* loaded as shown in Fig. 1. Also sketch the **Qualitative Deflected Shape**. There are internal hinges at *C* and *D*. Moments are applied on either side of the internal hinge at *D* as shown.

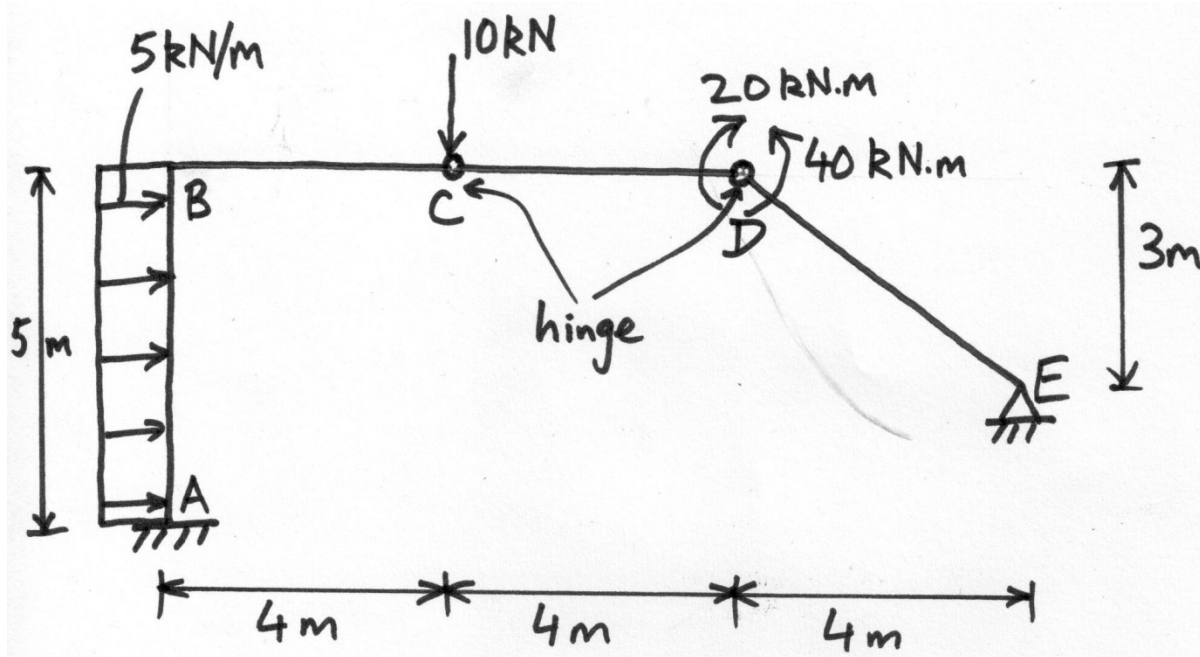


Fig. 1

Problem 2

The girder is continuously supported and has two internal hinges, as shown in Fig. 2. It supports the floor panels *AB*, *BC*, *CD*, *DE*, *EF*, as shown. A unit load moves along the floor panels. For the girder, draw Influence Line diagrams for (a) reaction at the fixed support at *F*, (b) bending moment at the fixed support at *F* and (b) shear in panel *CD*. (Hint: Muller Breslau principle is most efficient).

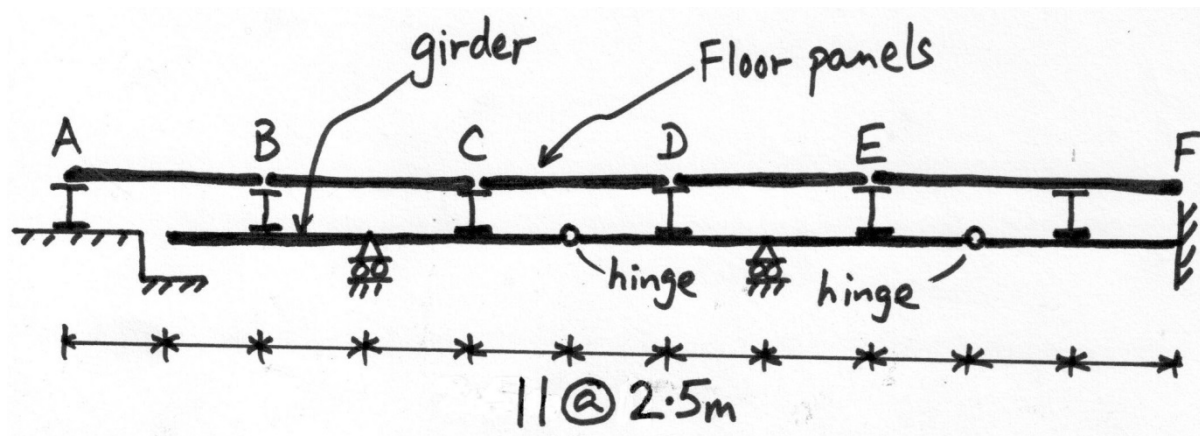
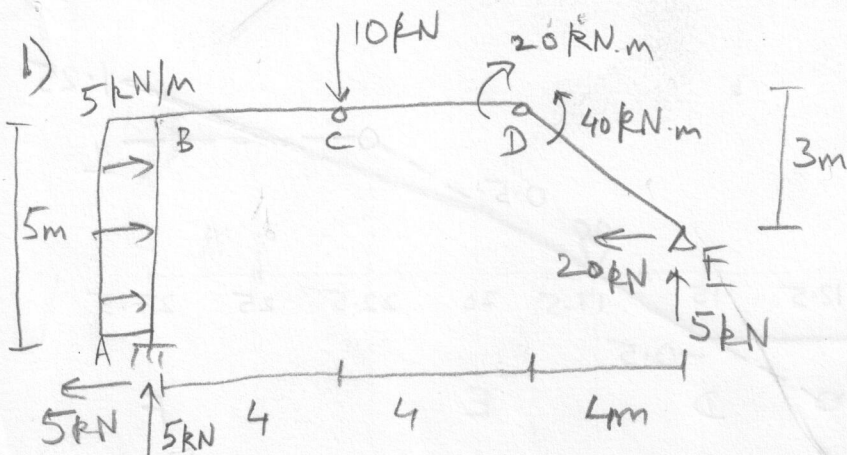
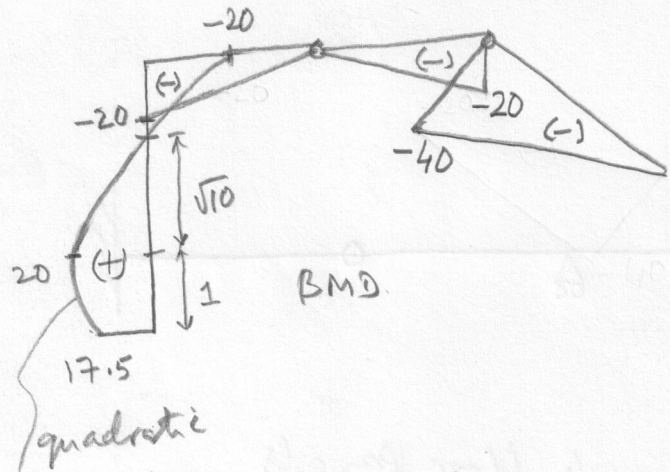
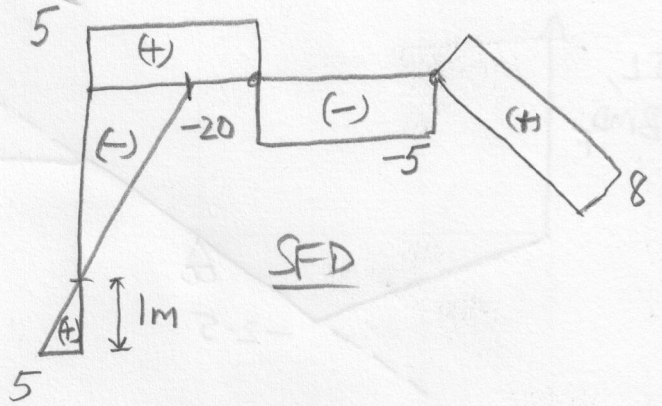
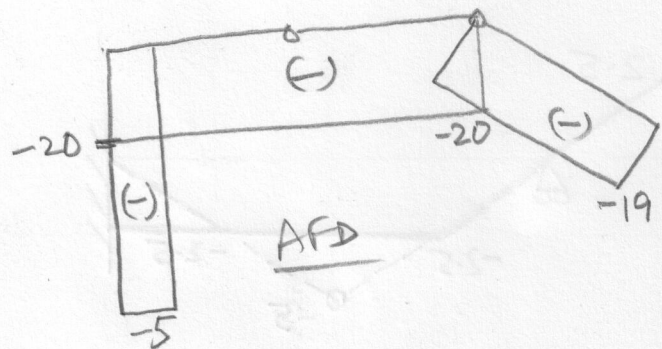
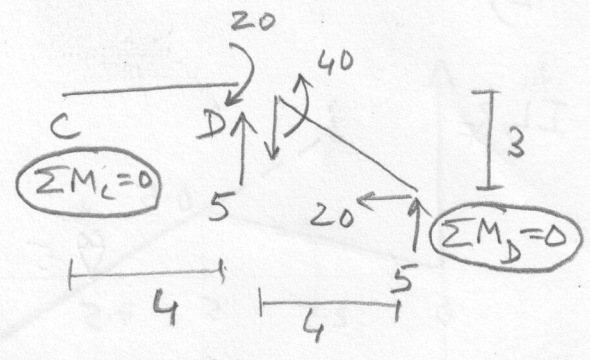


Figure 2

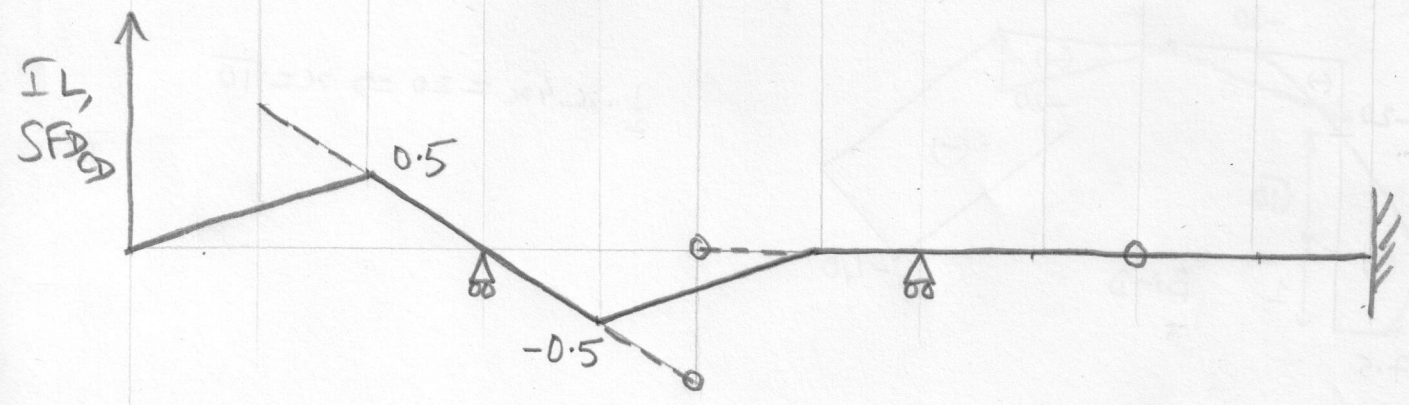
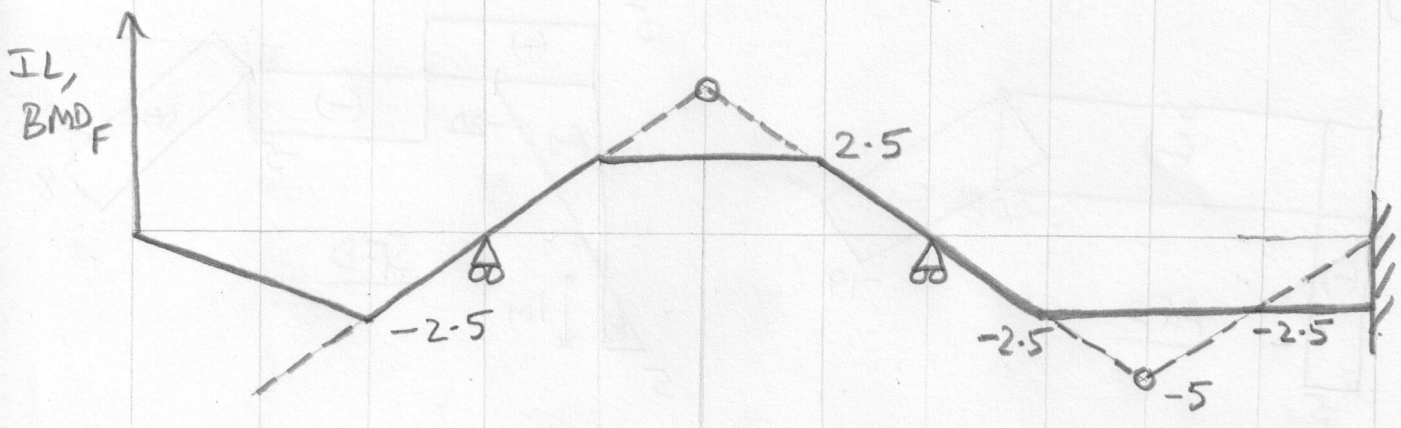
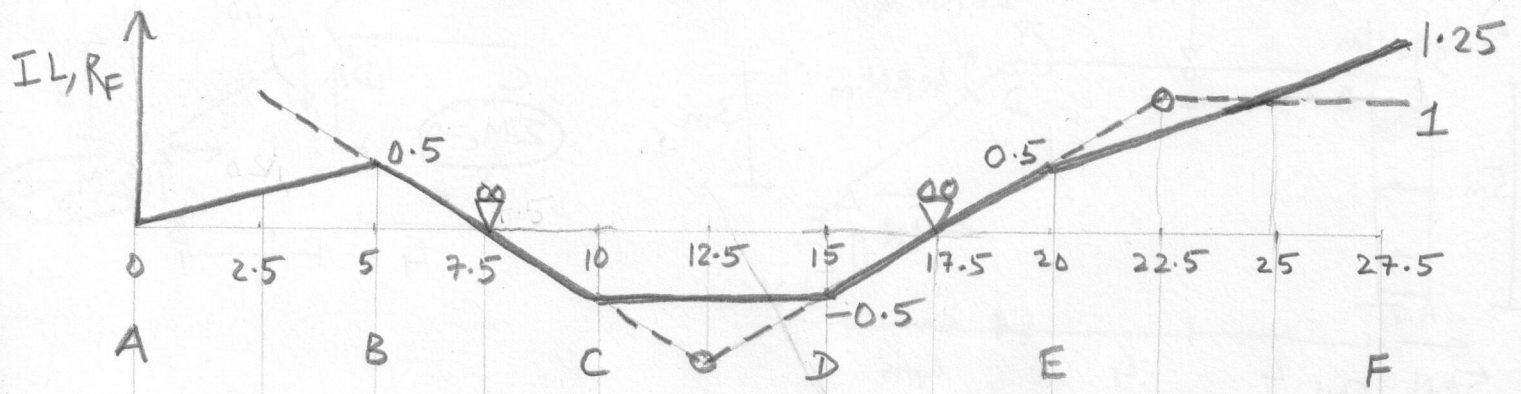


$\sum M_C = 0$
 17.5 kN



$\frac{1}{2} \cdot x \cdot 4x = 20 \Rightarrow x = \sqrt{10}$

2)



Dashed lines \rightarrow ILD of girder w/o floor panels
 Solid lines \rightarrow ILD of girder with floor panels

Procedure \rightarrow draw ILD's of girder w/o floor panels.
 Mark I-beam points on this ILD. Join these marked points to represent the deflected shape of the floor panels without providing any further releases in the floor panels. This is the ILD of panel-girder system.