The propped-cantilevered beam BD is made up of a material with a Young's modulus of E and the cross-section of the beam has a second area moment of I. A point load P acts at end B of the beam.

    a) Draw a free body diagram of the beam (FBD).

    b) Write down the equilibrium equations for the bar from your FBD. Is this beam determinate or indeterminate?

    c) Choose a redundant reaction for the beam. (It is suggested that you use the reaction force at C as your redundant load.)

    d) Write down the strain energy in the system that involves your redundant load. You may ignore the effects of shear in your strain energy function.

    e) Use Castigliano's theorem to determine the redundant reaction that you chose earlier. Leave your answer in terms of, at most: E, I, P and a.

    f) Determine the reactions on the beam at locations C and D.