

科目：工程力學 適用：土木所應力

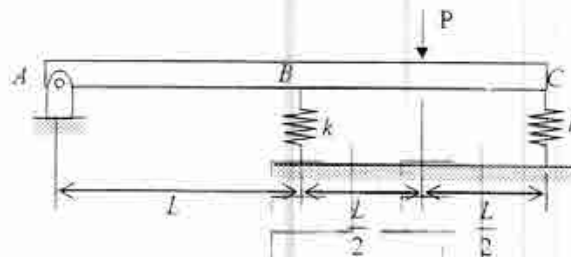
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考生注意：

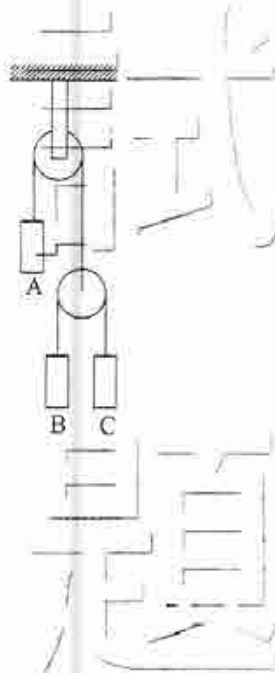
1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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- (1) The rigid beam of negligible weight is supported horizontally by two springs and a pin. If the springs are uncompressed when the load is removed, determine the force in each spring when the load  $P$  is applied. Also, compute the vertical deflection of end  $C$ . Assume the spring stiffness  $k$  is large enough so that only small deflections occur. [20%]



- (2) If cylinders B and C have a mass of 30 kg and 10 kg, respectively, determine the required mass of A so that it does not move when all the cylinders are released. Neglect the mass of the pulleys and the cords. [20%]



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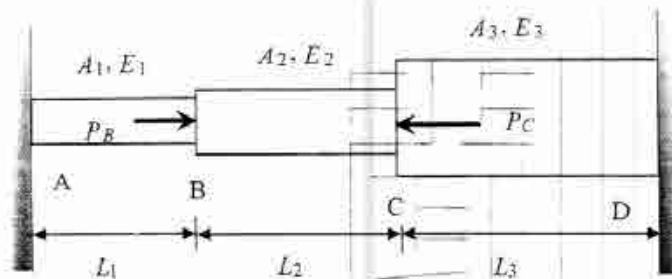
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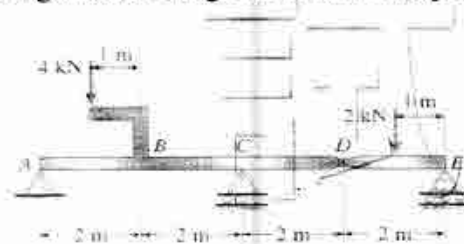
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- (3) A stepped rod is made up of three uniform members as shown in the figure. The rod exactly fits between rigid walls when no external forces are applied, and the ends of the rod are welded to the rigid walls.

- (a) Determine the displacements  $u_B$  and  $u_C$  of the two joints, where the external loads  $P_B$  and  $P_C$  are applied. [10%] (b) Determine the reaction force at the fixed ends  $A$  and  $D$ . [10%]



- (4) The compound beam  $ABCDE$  shown in the figure consists of two beams ( $AD$  and  $DE$ ) joined by a hinged connection at  $D$ . The hinge can transmit a shear force but not a bending moment. The loads on the beam consist of a  $4\text{-kN}$  force at the end of a bracket attached to  $B$  and a  $2\text{-kN}$  force at the midpoint of beam  $DE$ . Draw the shear-force and bending-moment diagrams for this compound beam. [20%]



- (5) For the statically indeterminate beam shown in figure, determine the reaction at the support  $A$  and  $B$ , the deflection curve of the beam, and the slope of  $\theta_A$ . [20%]

