

國立清華大學 103 學年度碩士班考試入學試題

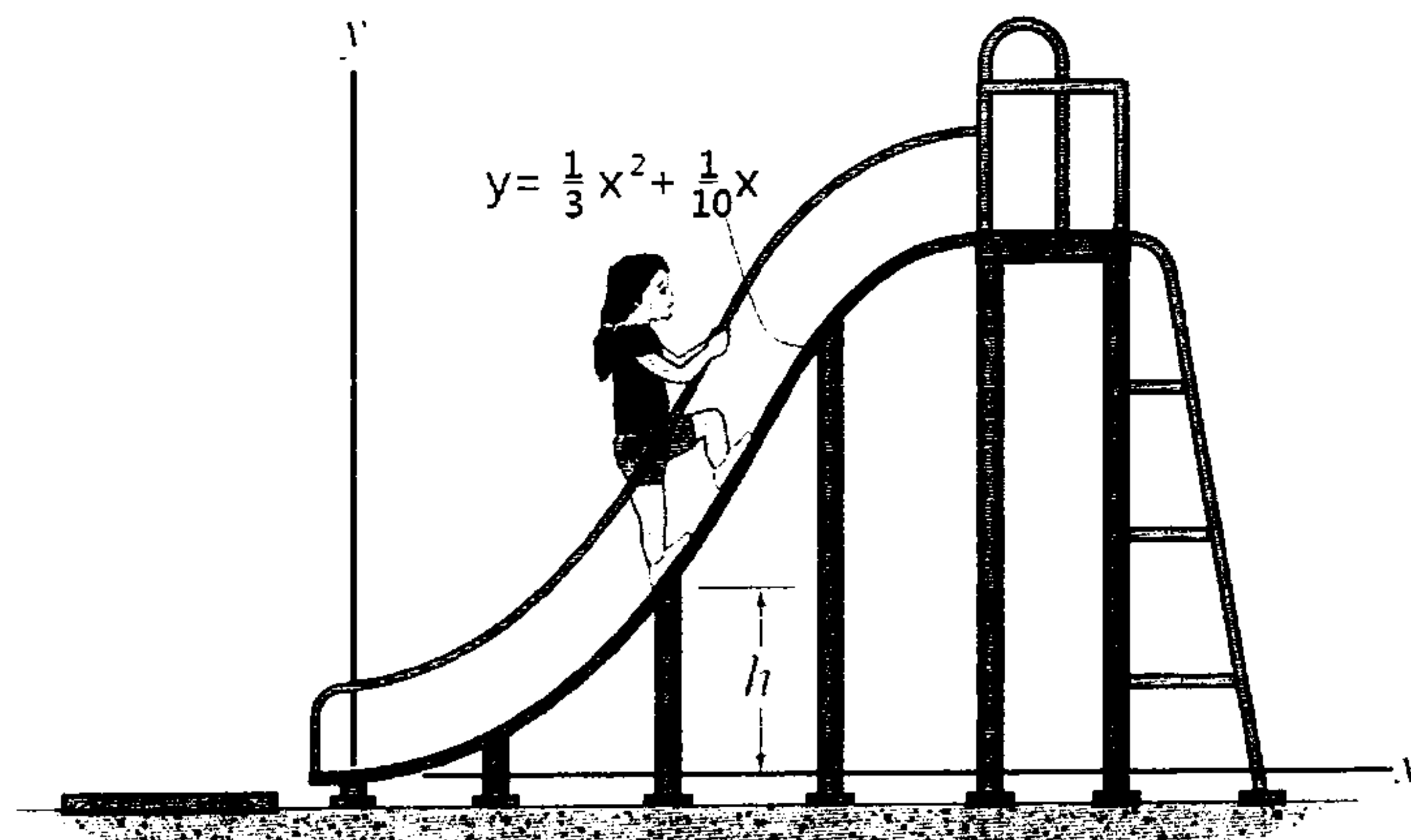
系所班組別：動力機械工程學系碩士班 丙組(固體與奈微米力學組)

考試科目 (代碼)：應用力學 (1302)

共 五 頁，第 一 頁 *請在【答案卷】作答

Q1 (total 15 pts)

Determine the maximum height h in meters to which the girl can walk up the slide without supporting herself by the rails or by her left leg. The coefficient of static friction between the girl's shoes and the slide is $\mu_s = 0.8$. Please draw the free-body diagram.



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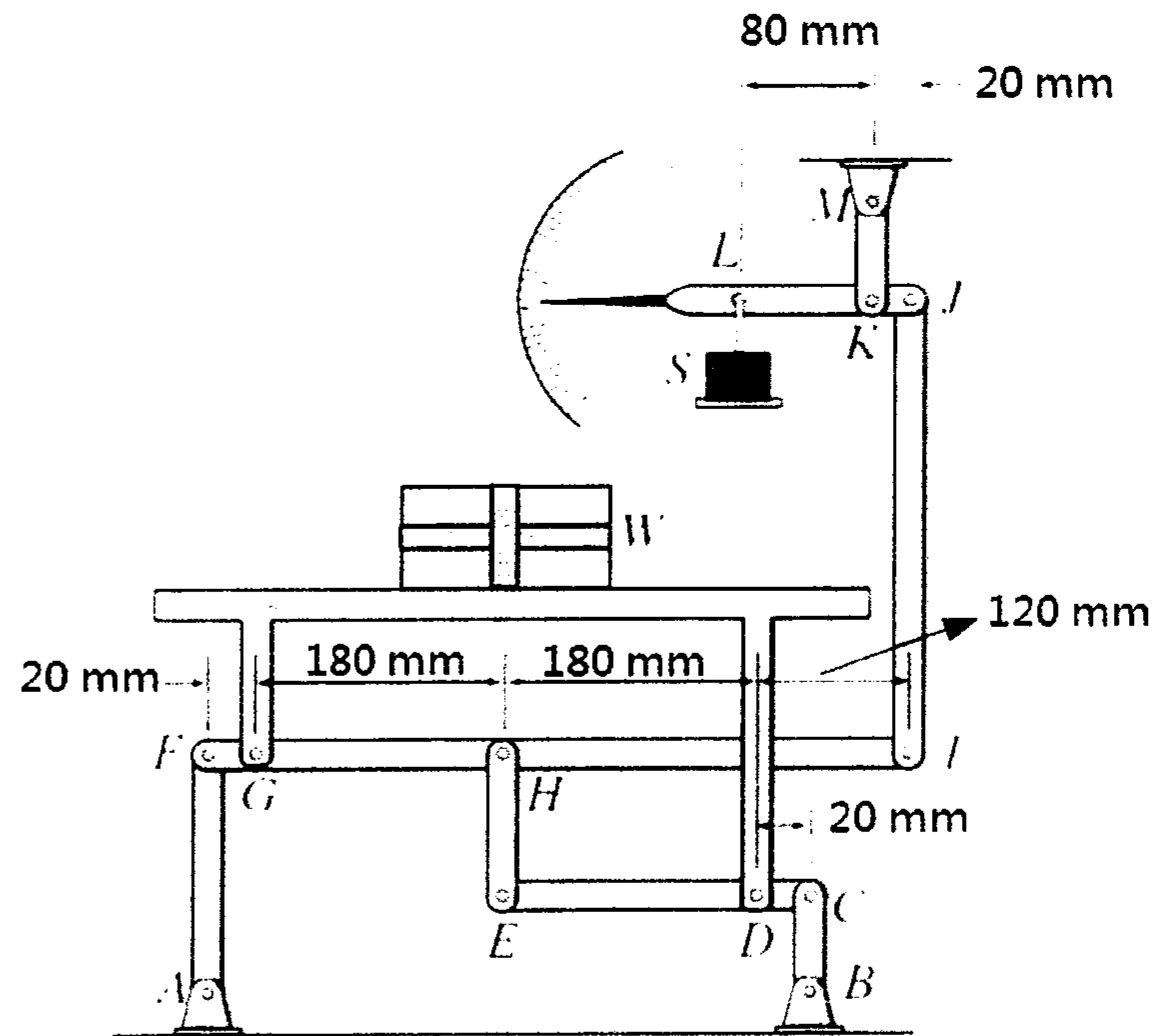
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Q2 (total 25 pts)

The lever-actuated scale consists of a series of compound levers. If a load of weight $W = 720 \text{ N}$ is placed on the platform, determine the required weight of the counterweight S to balance the load. Please draw all the free-body diagrams. Is it necessary to place the load symmetrically on the platform? Please explain the reason.



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Q3 (total 20 pts)

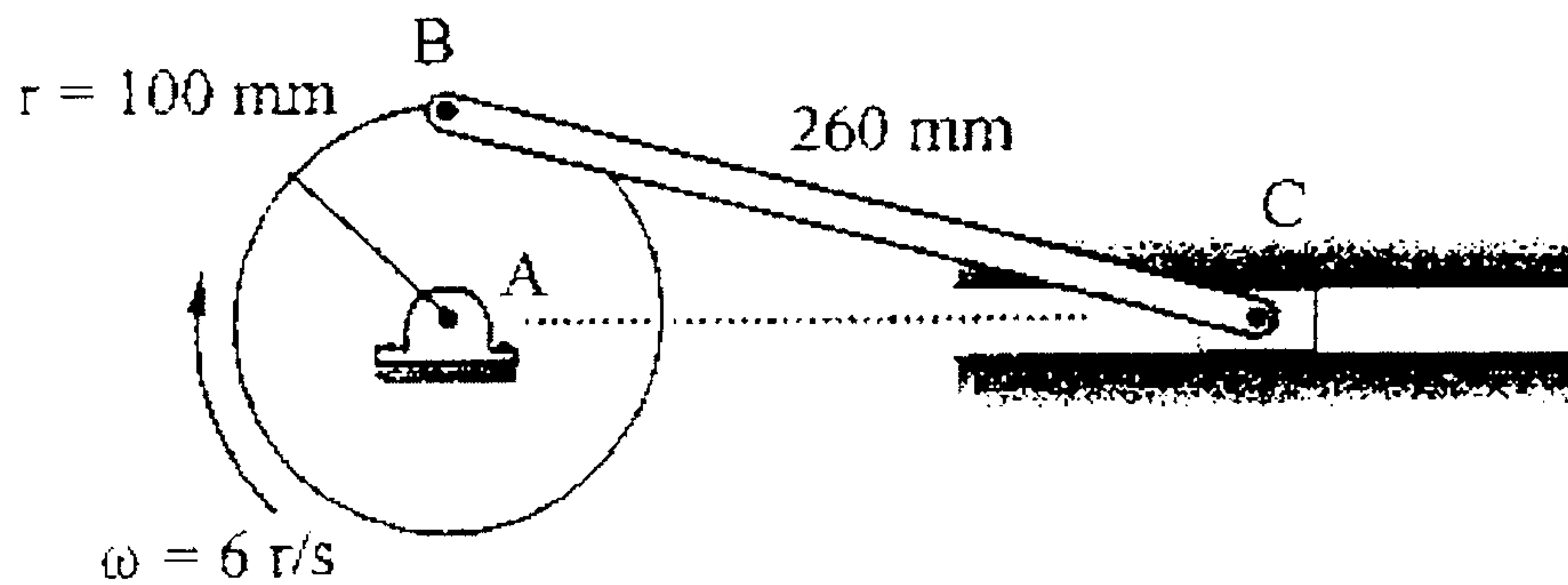
Below is shown a mechanism consisting of a rotating disk AB, a link BC and a friction-less slider at C. The wheel AB mounted at friction-less bearing A has a constant angular velocity of 6 radian/sec. At the instant shown, the link BC is translating (its angular velocity is zero).

- (a) Please determine the angular acceleration of link BC in term of radian per second squared and its direction using CW for clock-wise or CCE for counter clock-wise.

[10pts]

- (b) Please determine slider C's acceleration in meter per second squared and its direction.

[10pts]



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共 五 頁，第 四 頁 *請在【答案卷】作答

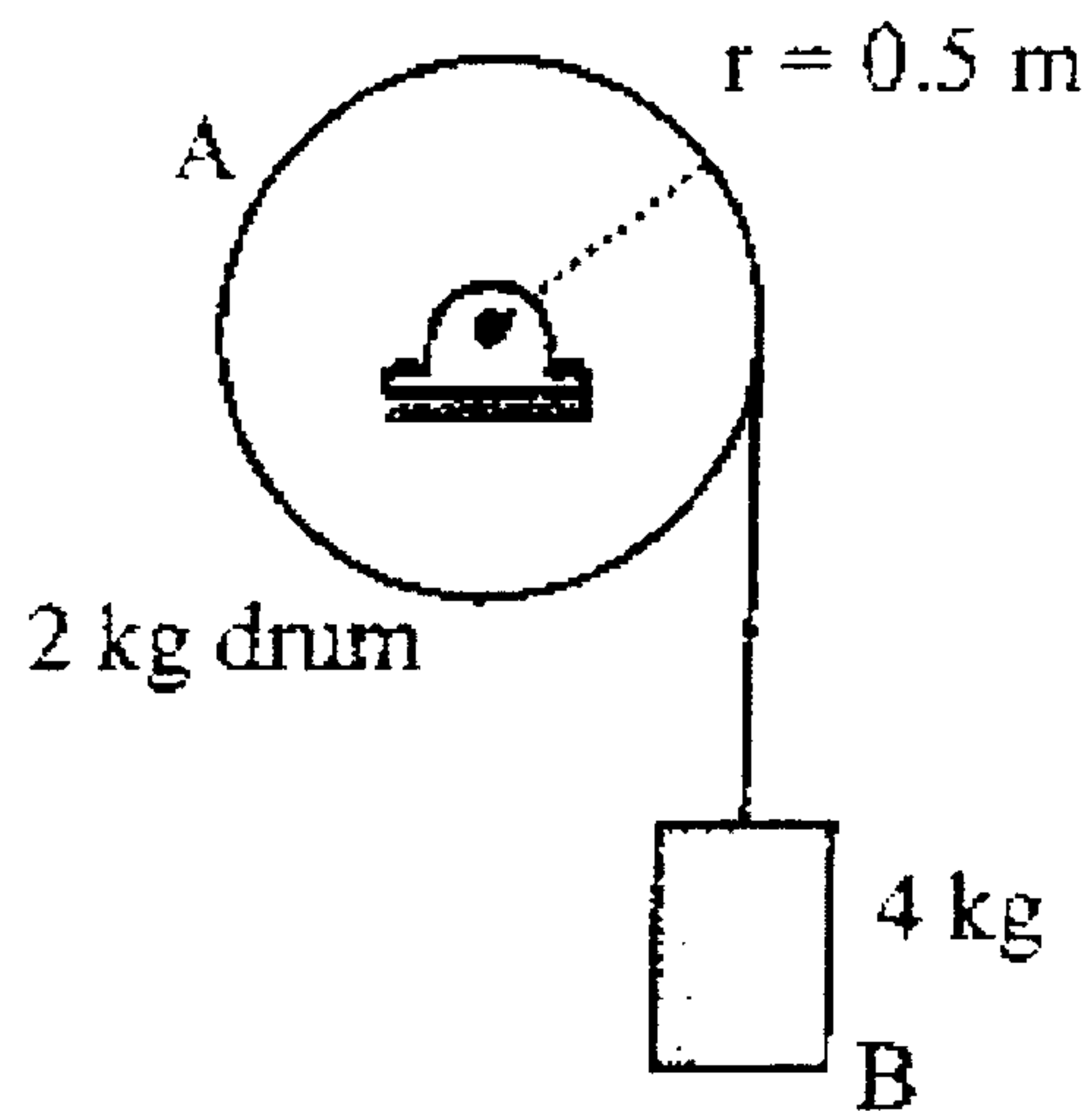
Q4 (total 20 pts)

A 4 kg mass B is suspended by a slender cable which wraps around a 2 kg drum A. When the system is released about to move

(a) Please determine the tension of the cable in terms of Newton. [10pts]

(b) The angular acceleration of the drum A in terms of radian per second squared.

[10pts]



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Q5 (total 20pts)

For the double pendulum system shown below, the two balls each has mass m are connected by inertia-less links each has length L . Each ball exhibits planar motion with respect to connecting friction-less joints of which motion can be described by angles q_1 and q_2 .

- (a) Suppose the gravitational force is the only force, please derive equations of motion for which angles q_1 and q_2 are relatively small when the balls are close the vertical line as shown. [10pts]
- (b) Linearize the equations of motion. Please clearly express the mass M and stiffness K matrices. [10pts]

