1. (20%) The compound beam shown in Fig. 1 is pin-connected at B. Determine the reaction at the support A. Please neglect its weight and thickness.

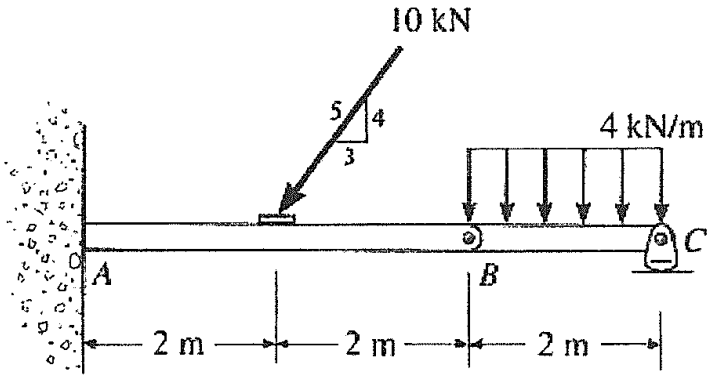

Fig. 1

2. (20%) At the instant shown in Fig. 2, the velocity of point A is 0.2 m/s to the right. Find the angular velocity of rod $\mathcal{B}$, and determine the velocity of its other end (point B) which is constraint to move in the circular slot.

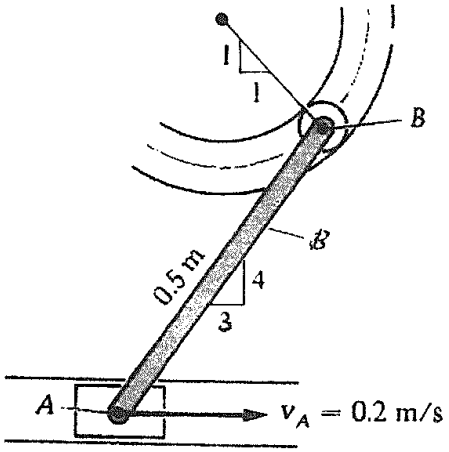

Fig. 2

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3. (20%) Collar $\mathcal{C}$ in Fig. 3 is pined to rod $\mathcal{R}$ at P and is free to slide along rod $\mathcal{B}$. The angular velocity of $\mathcal{R}$ is 0.2 rad/s in clockwise direction. Find the angular velocity of $\mathcal{B}$ at this time. Determine the velocity of P relative to $\mathcal{B}$.

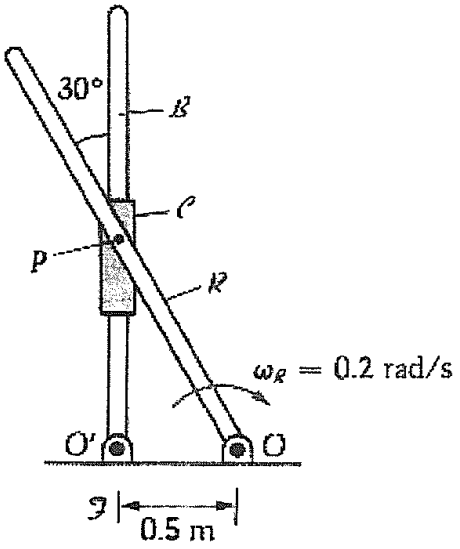

Fig. 3

4. (20%) As shown in Fig. 4, force P is applied to a plate that rests on a smooth surface with the friction coefficient μ_2 equal to 0. The friction coefficient between the Mass m and Mass M is given as μ_1. Find the largest force P for which the pipe will not slip on the plate.

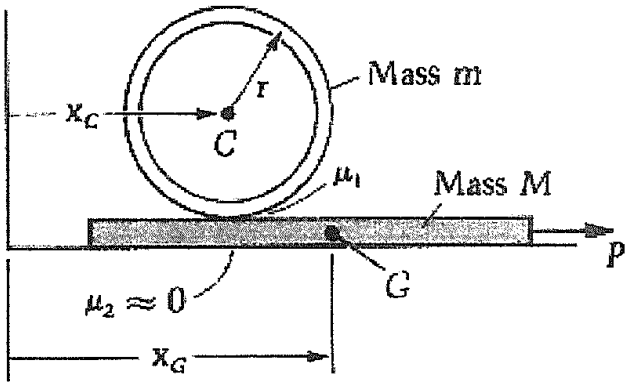

Fig. 4

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5. (20%) The 2-kg collar C in Fig. 5 turns along the smooth rod $\mathcal{R}$, which is l_2=1m long, has a mass of 3 kg, and is mounted in bearing with negligible friction. The angular speed is increased until the string located at l_1=0.3m breaks (its tensile strength is 60N) and at that instant the external moment is removed.
(a) (10%) Determine the angular velocity of C when the string breaks.
(b) (10%) Determine the angular velocity of $\mathcal{R}$ and the velocity of C (the mass center of C) when the collar leaves the rod.

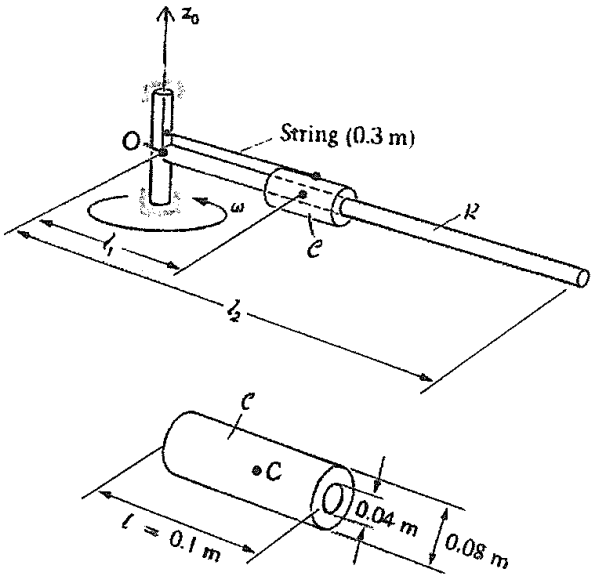

Fig. 5

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