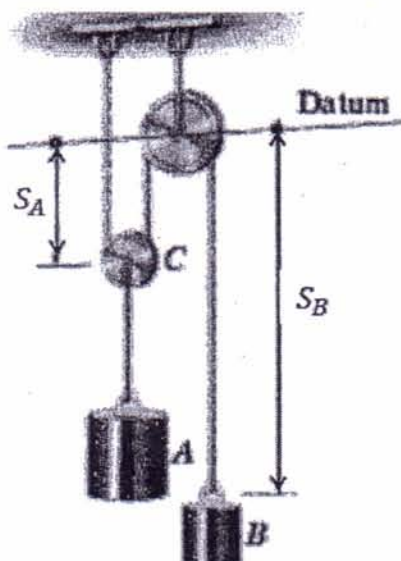


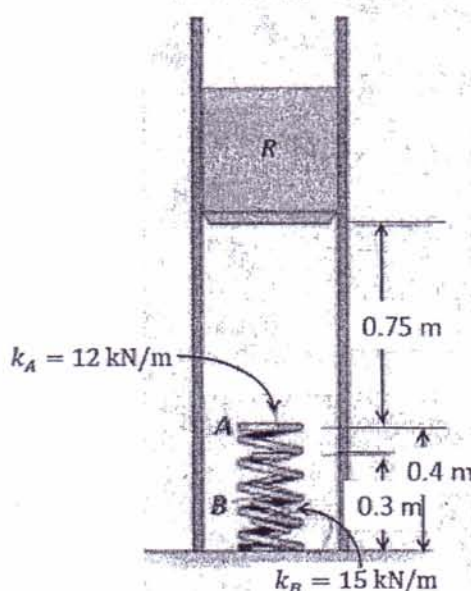
Exam Guidelines: This Exam contains 6 questions in 2 pages, start every question in a new page.

Question 1: [10 Marks] The 100-kg block A shown is released from rest. If the masses of the pulleys and the cord are neglected, determine the speed of the 20-kg block B in 2 s.

Question 2: [8 Marks] The ram R shown has a mass of 100 kg released from 0.75 m from the top of a spring, A, that has a stiffness $k_A = 12 \text{ kN/m}$. If a second spring B, having a stiffness $k_B = 15 \text{ kN/m}$ is nested to A, determine the maximum displacement of A needed to stop the downward motion of the ram. The unstretched length of each spring is indicated in the figure. Neglect the mass of the springs.

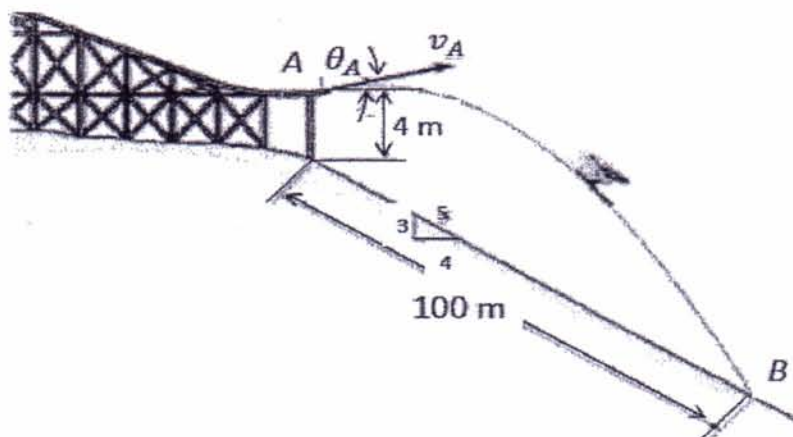


Question 1



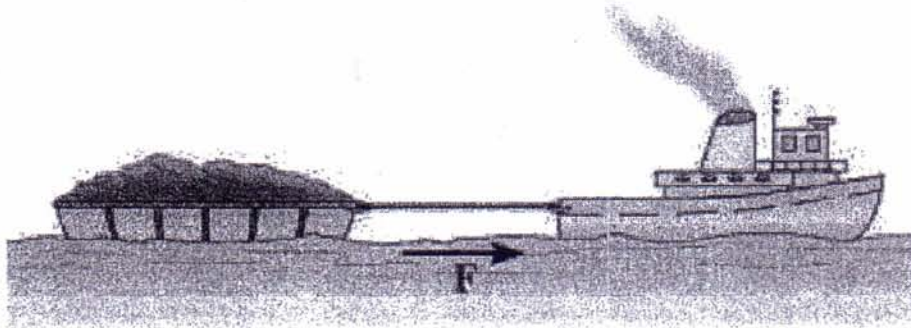
Question 2

Question 3: [6 Marks] It is observed that the skier leaves the ramp A at an angle $\theta_A = 25^\circ$ with the horizontal. If he strikes the ground at B, determine his initial speed v_A and the time of flight t_{AB} .



Question 3

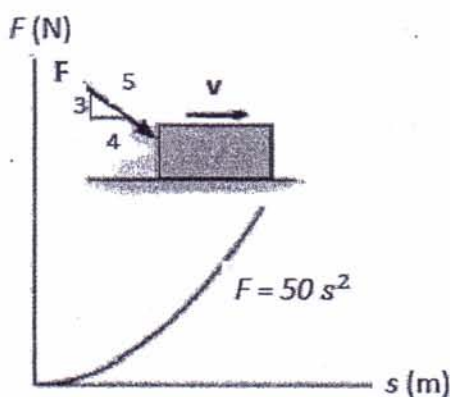
Question 4: [8 Marks] If it takes 35 s for the 50 Mg tugboat to increase its speed uniformly to 25 km/h, starting from rest, determine the force of the rope on the tugboat. The propeller provides the propulsion force F which gives the tugboat forward motion, whereas the 75 Mg barge moves freely. Also, determine F acting on the tugboat.



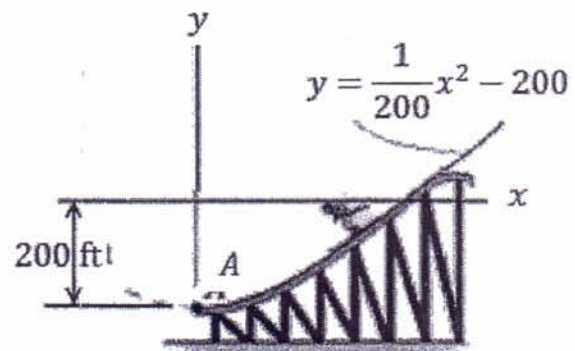
Question 4

Question 5: [10 Marks] The force F , acting in a constant direction on the 20 kg block, has a magnitude which varies with position s of the block. Determine the speed of the block after it slides 3 m. When $s = 0$, the block is moving to the right at 2 m/s. The coefficient of kinetic friction between the block and surface is $\mu_k = 0.3$.

Question 6: [8 Marks] Design the ski jump shown requires knowing the type of forces that will be exerted on the skier her approximate trajectory. If in this case the jump can be approximated by the parabola shown in the figure, determine the normal force on the 150 lb skier the instant she arrives at the end of the jump, pint A, where her velocity is 65 ft/s. Also, what is her acceleration at this point?



Question 5



Question 6