Department of Mathematics and Natural Sciences

PHY111 - Principles of Physics-I (Spring 2022)

Assignment-2

Total Marks: 25

Answer all questions.

1. Three blocks of masses 1.0, 2.0, and 4.0 kg are connected by two massless strings, one of which passes over a frictionless pulley of negligible mass as shown in Fig. 1.

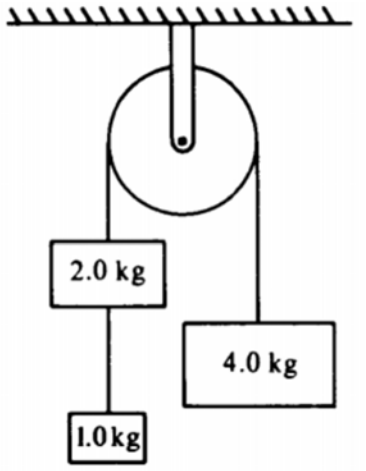

Fig. 1

(a) (4 marks) Draw the free body force diagrams of the pulley and all three blocks.

(b) (5 marks) Calculate the acceleration of the 4.0 kg block.

(c) (3 marks) What are the tensions in the string supporting the 4.0 kg block and in the string supporting the 1.0 kg block.

2. Two blocks are sliding to the right across a horizontal surface, as Fig. 2 shows. In Case A, the mass of each block is 3.0 kg. In Case B, the mass of block 1 (the block behind) is 6.0 kg, and the mass of block 2 is 3.0 kg. No frictional force acts on block 1 in either Case A or Case B. However, a kinetic frictional force of 5.8 N does act on block 2 in both cases and opposes the motion. For both Case A and Case B determine:

Fig. 2

(a) (*6 marks*) the magnitude of the forces with which the blocks push against each other.

(b) (*5 marks*) the magnitude of the acceleration of the blocks.

(c) (*2 marks*) the coefficient of kinetic friction between the horizontal surface and block 2.