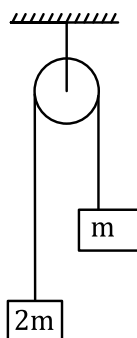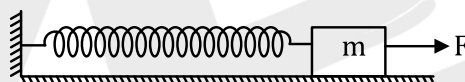## DPP – 5

CONSTRAINED MOTION & SPRING

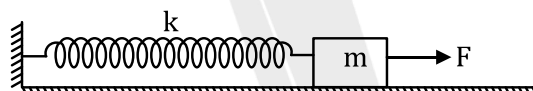**Q.1** The blocks are released from rest. Find the velocity of blocks when 2m mass downward by d is $\sqrt{\frac{Ngd}{N+1}}$. Then N =_____


Q.2 The block is at rest as shown in figure. A Constant force F is applied on block. The maxima velocity of the block v_{max} is $\frac{NF}{\sqrt{km}}$. Then N is _____


Q.3 Initially the block is at rest as shown in figure. A constant force F is applied on block find the maximum extension of spring. Initially spring is in natural length. The coefficient of friction is μ between block and horizontal surface. The maximum extension in spring is $N\frac{[F-Hmg]}{k}$. Then N is_____

Q.4 Figure shows two blocks of masses 2M and M respectively. The coefficient of friction between the block of mass 2M and the horizontal plane is μ. The system is released from rest. The velocity of the block of mass 'M' when the block of mass 2M has moved a distance 's' towards right is $\frac{1}{k_1}\sqrt{gs(1-k_2\mu)}$. Then $k_1 + k_2$ is_____
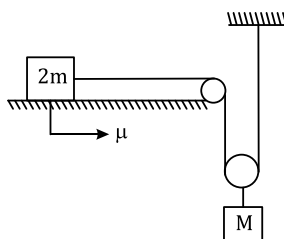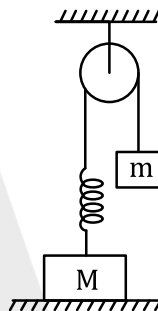

Q.5 The block is at rest spring is in natural length. find the max downward displacement of the block when system is released.
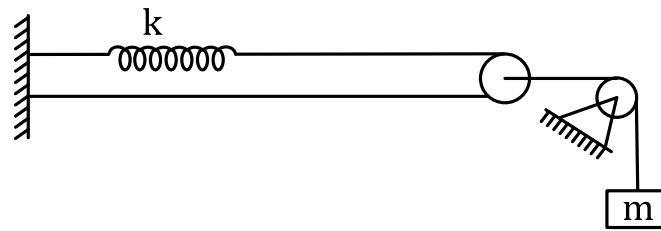
(A) $x_0 = \frac{mg}{2k}$ (B) $x_0 = \frac{mg}{3k}$ (C) $x_0 = \frac{mg}{4k}$ (D) $x_0 = \frac{mg}{8k}$

Q.6   Initially the blocks are at rest. The spring is in natural length. Find minimum mass m, so that when it is released block M, will be lifted due to extension in spring.


(A) $\frac{M_0}{2}$ (B) $\frac{M_0}{4}$ (C) $\frac{M_0}{6}$ (D) $\frac{M_0}{12}$

Q.7   A block of mass m is attached with a massless spring of force constant k. The block is placed over a rough inclined surface for which the coefficient of friction is $\mu = \frac{3}{4}$. The minimum value of M required to move the block up the plane is (neglect mass of string and pulley and friction is pulley).
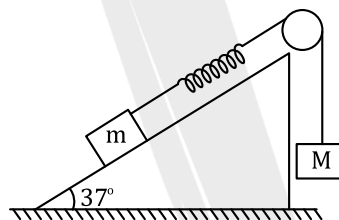
(A) $\frac{3}{5}m$ (B) $\frac{4}{5}m$ (C) $2m$ (D) $\frac{3}{2}m$

Q.8   Two blocks of masses m and M are moving with speeds v_1 and v_2 ($v_1 > v_2$) in the same direction on the V frictionless surface respectively, M being ahead of m. An ideal spring of force constant k is attached to the backside of M (as shown). The maximum compression of the spring when the blocks collide is
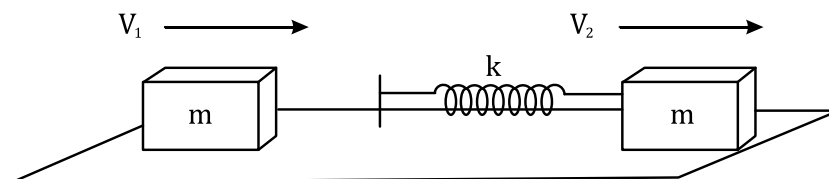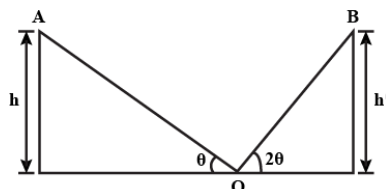

(A) $v_1\sqrt{\frac{m}{k}}$ (B) $v_2\sqrt{\frac{M}{k}}$

(C) $(v_1 - v_2)\sqrt{\dfrac{mM}{k(M+m)}}$ (D) None of the above

Q.9   A body starts to slide from A, down an inclined smooth plane AO having inclination θ with the horizontal and then ascends a smooth plane OB. If t_{AO} and t_{OB} are the time to move particle from A to O and O to B respectively then,

(A) $t_{AO} > t_{OB}$ (B) $t_{AO} < t_{OB}$ (C) $t_{AO} = t_{OB}$ (D) $h' = 2h$

ANSWER KEY

1. 2 **2.** 1 **3.** 2 **4.** 7 **5.** (A) **6.** (A) **7.** (A)

8. (C) **9.** (A)

Home Work

Ex. 1	Q. 1
Ex. 2	Q. 8,9,11,13
Ex.3	Q. 8, 11, 20,22
Ex.4	Q. 3,8,11,
Ex.5	Q.6,