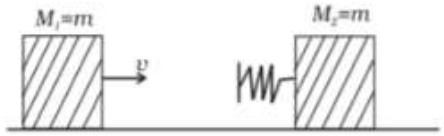
06. Two blocks M_1 and M_2 having equal mass are free to move on a horizontal frictionless surface. M_2 is attached to a massless spring as shown in Figure. Iniially M_2 is at rest and M_1 is moving toward M_2 with speed v and collides head-on with M_2.



i. While spring is fully compressed all the KE of M_1 is stored as PE of spring.
ii. While spring is fully compressed the system momentum is not conserved, though final momentum is equal to initial momentum.
iii. If spring is massless, the final state of the M_1 is state of rest.
iv. If the surface on which blocks are moving has friction, then collision cannot be elastic.

Sol. (iii, iv) If it is not specified we always consider the collision elastic When two bodies of equal masses collide elastically, their velocities are interchanged in these types of collision.
Kinetic energy and linear momentum remain conserved
According to the above diagram when m_1 comes in contact with the spring, m_1, is retarded by the spring force and m_2 is accelerated by the spring force.

i. The spring will continue x to compress until the two blocks acquire common velocity. So some of the kinetic energy of block M_x store into P.E and some part of it stores into K.E of block M_2. So option (i) is incorrect.
ii. As surfaces are frictionless momentum of the system will be conserved. So option (ii) is also incorrect.
iii. The two bodies of equal mass exchange their velocities in a head-on elastic collision between them. So if spring is massless, the final state of the M_1 is state of rest.
iv. since there is a loss of K. E when the blocks collide on the rough surface. Hence, the collision is inelastic.