MCQ II

5.10 The motion of a particle of mass m is given by $x = 0$ for $t < 0$ s, $x(t) = A \sin 4p\, t$ for $0 < t < (1/4)$ s $(A > o)$, and $x = 0$ for $t > (1/4)$ s. Which of the following statements is true?

(a) The force at $t = (1/8)$ s on the particle is $-16\pi^2 A\, m$.

(b) The particle is acted upon by on impulse of magnitude $4\pi^2 A\, m$ at $t = 0$ s and $t = (1/4)$ s.

(c) The particle is not acted upon by any force.

(d) The particle is not acted upon by a constant force.

(e) There is no impulse acting on the particle.

5.11 In Fig. 5.1, the co-efficient of friction between the floor and the body B is 0.1. The co-efficient of friction between the bodies B and A is 0.2. A force **F** is applied as shown

on B. The mass of A is $m/2$ and of B is m. Which of the following statements are true?

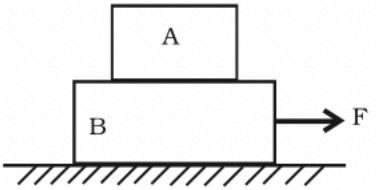

Fig. 5.1

(a) The bodies will move together if $F = 0.25\ mg$.
(b) The body A will slip with respect to B if $F = 0.5\ mg$.
(c) The bodies will move together if $F = 0.5\ mg$.
(d) The bodies will be at rest if $F = 0.1\ mg$.
(e) The maximum value of F for which the two bodies will move together is $0.45\ mg$.

5.12 Mass m_1 moves on a slope making an angle θ with the horizontal and is attached to mass m_2 by a string passing over a frictionless pulley as shown in Fig. 5.2. The co-efficient of friction between m_1 and the sloping surface is μ.

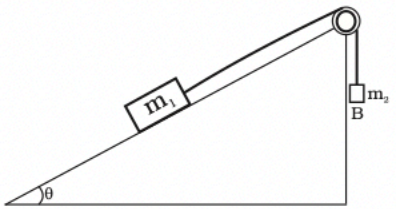

Fig. 5.2

Which of the following statements are true?

(a) If $m_2 > m_1 \sin\theta$, the body will move up the plane.

(b) If $m_2 > m_1 (\sin\theta + \mu \cos\theta)$, the body will move up the plane.

(c) If $m_2 < m_1 (\sin\theta + \mu \cos\theta)$, the body will move up the plane.

(d) If $m_2 < m_1 (\sin\theta - \mu \cos\theta)$, the body will move down the plane.

5.13 In Fig. 5.3, a body A of mass m slides on plane inclined at angle θ_1 to the horizontal and μ_1 is the coefficent of friction between A and the plane. A is connected by a light string passing over a frictionless pulley to another body B, also of mass m, sliding on a frictionless plane inclined at angle θ_2 to the horizontal. Which of the following statements are true?

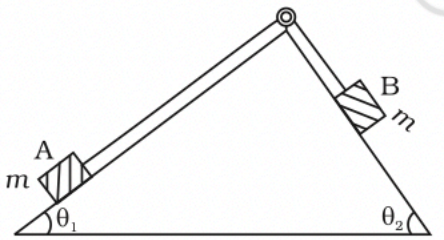

Fig. 5.3

(a) A will never move up the plane.
(b) A will just start moving up the plane when

$$\mu = \frac{\sin\theta_2 - \sin\theta_1}{\cos\theta_1}.$$

(c) For A to move up the plane, θ_2 must always be greater than θ_1.
(d) B will always slide down with constant speed.

5.14 Two billiard balls A and B, each of mass 50g and moving in opposite directions with speed of 5m s^{-1} each, collide and rebound with the same speed. If the collision lasts for 10^{-3} s, which of the following statements are true?

(a) The impulse imparted to each ball is 0.25 kg m s^{-1} and the force on each ball is 250 N.

(b) The impulse imparted to each ball is 0.25 kg m s^{-1} and the force exerted on each ball is 25×10^{-5} N.

(c) The impulse imparted to each ball is 0.5 Ns.

(d) The impulse and the force on each ball are equal in magnitude and opposite in direction.

5.15 A body of mass 10kg is acted upon by two perpendicular forces, 6N and 8N. The resultant acceleration of the body is

(a) 1 m s^{-2} at an angle of $\tan^{-1}\left(\frac{4}{3}\right)$ w.r.t. 6N force.

(b) 0.2 m s^{-2} at an angle of $\tan^{-1}\left(\frac{4}{3}\right)$ w.r.t. 6N force.

(c) 1 m s^{-2} at an angle of $\tan^{-1}\left(\frac{3}{4}\right)$ w.r.t.8N force.

(d) 0.2 m s^{-2} at an angle of $\tan^{-1}\left(\frac{3}{4}\right)$ w.r.t.8N force.