## MCQ I

**5.1** A ball is travelling with uniform translatory motion. This means that

(a) it is at rest.

(b) the path can be a straight line or circular and the ball travels with uniform speed.

(c) all parts of the ball have the same velocity (magnitude and direction) and the velocity is constant.

(d) the centre of the ball moves with constant velocity and the ball spins about its centre uniformly.

**5.2** A metre scale is moving with uniform velocity. This implies

(a) the force acting on the scale is zero, but a torque about the centre of mass can act on the scale.

(b) the force acting on the scale is zero and the torque acting about centre of mass of the scale is also zero.

(c) the total force acting on it need not be zero but the torque on it is zero.

(d) neither the force nor the torque need to be zero.

**5.3** A cricket ball of mass 150 g has an initial velocity $\mathbf{u} = (3\hat{\mathbf{i}} + 4\hat{\mathbf{j}})\,\text{m s}^{-1}$ and a final velocity $\mathbf{v} = -(3\hat{\mathbf{i}} + 4\hat{\mathbf{j}})\,\text{m s}^{-1}$ after being hit. The change in momentum (final momentum-initial momentum) is (in kg m $s^{1}$)

(a) zero

(b) $-(0.45\hat{\mathbf{i}} + 0.6\hat{\mathbf{j}})$

(c) $-(0.9\hat{\mathbf{i}} + 1.2\hat{\mathbf{j}})$

(d) $-5(\hat{\mathbf{i}} + \hat{\mathbf{j}})$.

**5.4** In the previous problem (5.3), the magnitude of the momentum transferred during the hit is

(a) Zero (b) 0.75 kg m $s^{-1}$ (c) 1.5 kg m $s^{-1}$ (d) 14 kg m $s^{-1}$.

**5.5** Conservation of momentum in a collision between particles can be understood from

(a) conservation of energy.

(b) Newton's first law only.

(c) Newton's second law only.

(d) both Newton's second and third law.

**5.6** A hockey player is moving northward and suddenly turns westward with the same speed to avoid an opponent. The force that acts on the player is

(a) frictional force along westward.

(b) muscle force along southward.

(c) frictional force along south-west.

(d) muscle force along south-west.

**5.7** A body of mass 2kg travels according to the law $x(t) = pt + qt^2 + rt^3$ where $p = 3\,\text{m s}^{-1}$, $q = 4\,\text{m s}^{-2}$ and $r = 5\,\text{m s}^{-3}$.

The force acting on the body at $t = 2$ seconds is

(a) 136 N

(b) 134 N

(c) 158 N

(d) 68 N

**5.8** A body with mass 5 kg is acted upon by a force $\mathbf{F} = \left(-3\hat{\mathbf{i}} + 4\hat{\mathbf{j}}\right)$ N. If its initial velocity at $t = 0$ is $\boldsymbol{v} = \left(6\hat{\mathbf{i}} - 12\hat{\mathbf{j}}\right)$ m $s^{-1}$, the time at which it will just have a velocity along the $y$-axis is

(a) never

(b) 10 s

(c) 2 s

(d) 15 s

**5.9** A car of mass $m$ starts from rest and acquires a velocity along east $\boldsymbol{v} = v\hat{\mathbf{i}}\,(v > 0)$ in two seconds. Assuming the car moves with uniform acceleration, the force exerted on the car is

(a) $\frac{mv}{2}$ eastward and is exerted by the car engine.

(b) $\frac{mv}{2}$ eastward and is due to the friction on the tyres exerted by the road.

(c) more than $\frac{mv}{2}$ eastward exerted due to the engine and overcomes the friction of the road.

(d) $\frac{mv}{2}$ exerted by the engine .