TOPIC :- LAWS OF MOTION & WORK ENERGY AND POWER

It has been observed that the boxes and luggages placed in trucks with open rear ends fall down if these vehicles are accelerated. To avoid such a situation, the rear ends of the trucks or trolleys are closed. Consider a box of mass 40 kg placed at a distance of 2 m from the open rear end of a long trolley. Trolley started from a rest and it was accelerated uniformly at the rate of 20 ms^{-2} .The coefficient of friction between the box and the surface of the trolley is 0.2. It was observed that the box fell down, when the trolley moved through some distance. (Take g = 10 ms^{-2})

(i) The net force acting on the box towards the rear end of the trolley is
(a) 700 N (b) 720 N (c) 740 N (d) 760 N

ANS:- (b) 720 N

(ii) The time after which the box to fall off from the rear end of the trolley is
(a) √2 sec (b) 2 sec (c) √2/3 sec (d) 4 sec

ANS:- (c) √2/3 sec

(iii) A body of mass m slides down a rough inclined plane of angle . The acceleration of the body at any instant is

$(a)\ g$ $(b)\ g \sin\theta$
$(c)\ g(\sin\theta - \mu_k \cos\theta)$ $(d)\ g(\sin\theta + \mu_k \cos\theta)$

ANS:- ©

(iv) μ_s μ_k and μ_r are the coefficients of static friction, kinetic friction and rolling friction respectively then-
(a) $\mu_s > \mu_k < \mu_r$ (b) $\mu_s < \mu_k > \mu_r$ © $\mu_s < \mu_k < \mu_r$ (d) $\mu_s > \mu_k > \mu_r$

ANS:- (d) $\mu_s > \mu_k > \mu_r$

These questions are Assertion (A) and Reason (R) type questions. Two statements are given - one labelled Assertion (A) and the other labelled Reason (R).
Select the correct answer from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false and Reason (R) is also false

(v) Assertion (A): the apparent weight of the body in an elevator moving with some downward acceleration is less than the actual weight of the body.
Reason (R): the part of the weight is spent in producing downward acceleration when body is in elevator

ANS:-**(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).**

(vi) Assertion: When a ball collides elastically with a floor, it rebounds with the same velocity as with its strikes.
Reason: Momentum of earth plus ball system remains constant

ANS:- **(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).**

Q6. When a force is applied on a body and the body is displaced in the direction of force, then the kinetic energy of the body changes. This change in the kinetic energy of the body is measured in terms of work, i.e. the change in kinetic energy of the body must be equal to work done. It is also known as the work energy theorem. If m is the mass of body, u is initial velocity of body, v is final velocity of body then Work done = Change in kinetic energy, W= ½ mv2 - ½ mu2
Questions:
(i) The kinetic energy of a body of mass 2 kg and momentum 2 kgm/s
(a) 1J (b) 2J (c) 3J (d) 4 J

ANS:- (a) 1J

(ii) Two bodies of mass m and 4m have equal kinetic energies. Ratio of their linear momenta is:

(a) 1:4 (b)1:2 (c) 1:1 (d) 2:1

ANS:- (b)1:2

(iii) If the momentum is increased by 20% , then the KE is increases by:

(a) 48% (b) 40 % (c) 44 % (d) 35 %

ANS:- (c) 44 %

(iv) A truck and a car are moving with same kinetic energy Both are brought to rest by applying the same retarding force. S_1 is the distance travelled by truck before coming to rest and S_2 is the distance travelled by the car before coming to rest.

(a) $S_1 = S_2$ (b) $S_1 > S_2$ © $S_1 < S_2$ (d) None of these

ANS:- (a) $S_1 = S_2$