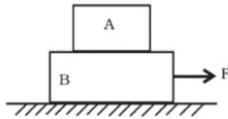


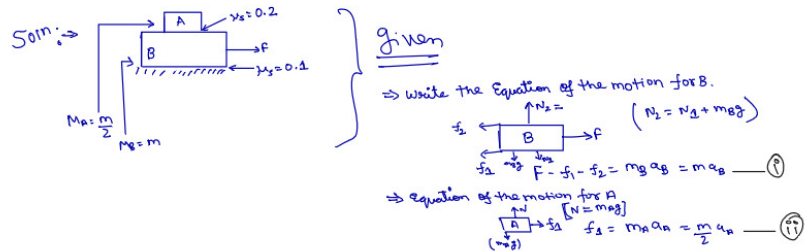
QUES 02:-

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?

- The bodies will move together if $F = 0.25 mg$.
- The body A will slip with respect to B if $F = 0.5 mg$.
- The bodies will move together if $F = 0.5 mg$.
- The bodies will be at rest if $F = 0.1 mg$.
- The maximum value of F for which the two bodies will move



\Rightarrow In this kind of problem write all the possible Equation of motion and analyze all the value based on different cases mentioned in the true option.

\Rightarrow Option A: \Rightarrow So here condition is that both blocks move together, which implies that both have same acceleration. ($a_A = a_B$)

Equate $a_A = a_B$ from (i) and (ii).

$$\Rightarrow \frac{F - f_1 - f_2}{m} = \frac{f_1}{m/2}$$

$$\Rightarrow F = 3f_1 + f_2$$

Since $f_{\text{max}} = \frac{3m g}{20}$ and when $F > f_2$; we can conclude B slips

w.r.t ground; hence $f_2 = \frac{3m g}{20}$ (limiting).

$$\rightarrow F = 3f_1 + \frac{3m g}{20}$$

or no slipping \Rightarrow $f_1 = \frac{F - \frac{3m g}{20}}{3} \Rightarrow 0 < f_1 < (0.2) \frac{m g}{2}$
 $0 < \frac{F - \frac{3m g}{20}}{3} < \frac{m g}{10} \Rightarrow \frac{m g}{20} < F < \frac{3m g}{20}$

Let's analyze the motion when: $\frac{m g}{20} < F < \frac{3m g}{20}$

Case \Rightarrow (i) now this condition is derived when A and B don't slip w.r.t to each other.

(ii) now when $F > \frac{3m g}{20}$; Both A and B will move

But A and B will slip w.r.t each other.

(i) when $F < \frac{m g}{20}$; here $F < f_2$ (limiting); hence B will not slip w.r.t ground and due to that f_1 will also be 0, and hence A would also not move.

from here we can see that option A, B, D, E are correct.