

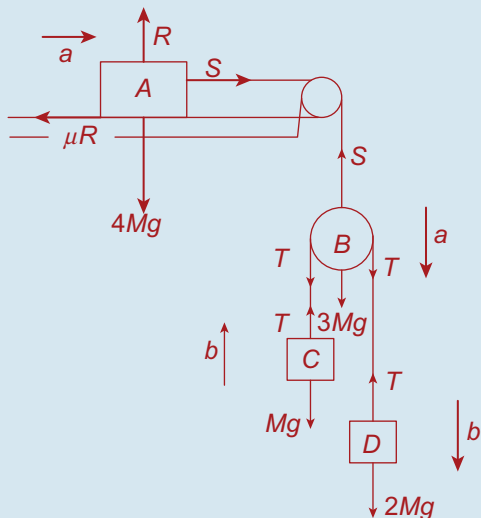
$$E \text{ becomes } 3a + 3g - 3g = 3f - 3a$$

$$\Rightarrow f - 2a = 0$$

$$\text{Solving these gives } a = \frac{1}{15}g \text{ m/s}^2,$$

$$f = \frac{2}{15}g \text{ m/s}^2$$

Q. 2.



$$\text{Since } R = 4Mg, \mu R = \frac{1}{2}(4Mg) = 2Mg$$

$$A: S - 2Mg = 4Ma$$

$$B: 3Mg + 2T - S = 3Ma$$

$$C: T - Mg = M(b - a)$$

$$D: 2Mg - T = 2M(b + a)$$

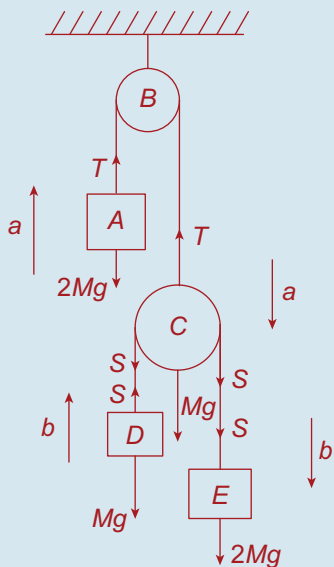
$$\text{Adding C and D } \Rightarrow 3b + a = g$$

$$A + B - C + D \Rightarrow b + 10a = 4g$$

$$\text{Solving these gives } a = \frac{11}{29}g \text{ m/s}^2,$$

$$b = \frac{6}{29}g \text{ m/s}^2$$

Q. 3.



$$A: T - 2Mg = 2Ma$$

$$C: Mg + 2S - T = Ma$$

$$D: S - Mg = M(b - a)$$

$$E: 2Mg - S = 2m(b + a)$$

$$D + E \Rightarrow Mg = 3Mb + Ma$$

$$\Rightarrow 3b + a = g$$

$$A + C - D + E \Rightarrow 2Mg = Mb + 6Ma$$

$$\Rightarrow b + 6a = 2g$$

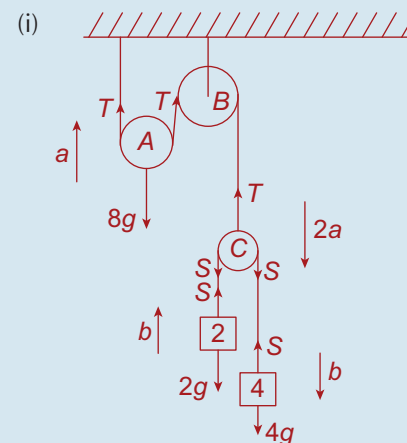
$$\text{Solving these gives } a = \frac{5}{17}g, b = \frac{4}{17}g$$

$$\text{Acceleration of D} = b - a = \frac{-g}{17}$$

i.e. $\frac{8}{17}$ downward.

$$\text{Acceleration of E} = b + a = \frac{9}{17}g \text{ downward.}$$

Q. 4.



$$A: 2T - 8g = 8a$$

$$C: 2s - T = 0(2a)$$

$$\Rightarrow T = 2s$$

$$D: (2 \text{ kg}): S - 2g = 2(b - 2a)$$

$$E: (4 \text{ kg}): 4g - S = 4(b + 2a)$$

$$C: T = 2S$$

$$\Rightarrow A \text{ becomes } 4S - 8g = 8a$$

$$\Rightarrow S = 2a + 2g$$

$$\therefore D \text{ becomes } 2a + 2g - 2g = 2(b - 2a)$$

$$\Rightarrow 6a - 2b = 0$$

$$E \text{ becomes } 4g - 2a - 2g = 4(b + 2a)$$

$$\Rightarrow 5a + 2b = g$$

$$\text{Solving these gives } a = \frac{g}{11}, b = \frac{3g}{11}$$