Question:

A source and an observer move away from each other with a velocity of 10m/s with respect to ground. If the observer finds the frequency of sound coming from the source as 1950 Hz, then actual frequency of the source is (velocity of sound in airt =340m/s):

a) 2132Hz

b) 1950Hz

c) 2486Hz

d) 2068Hz

Answer:

$$F = F_0 \frac{c + v_R}{c + v_S}$$

F - observed frequency;

F_0 - emitted frequency;

c - the velocity of waves in the medium;

v_R - the velocity of the observer relative to the medium («+v_R» - observer is moving towards the source, «-v_R» - observer is moving from the source);

v_S - the velocity of the source relative to the medium((«+v_S» - source is moving from the observer, «-v_S» - source is moving to the source);

$$F_0 = F \frac{c + v_S}{c + v_R} = 1950 * \frac{340 + 10}{340 - 10} = 2068 \, Hz$$

Answer: d)2068Hz