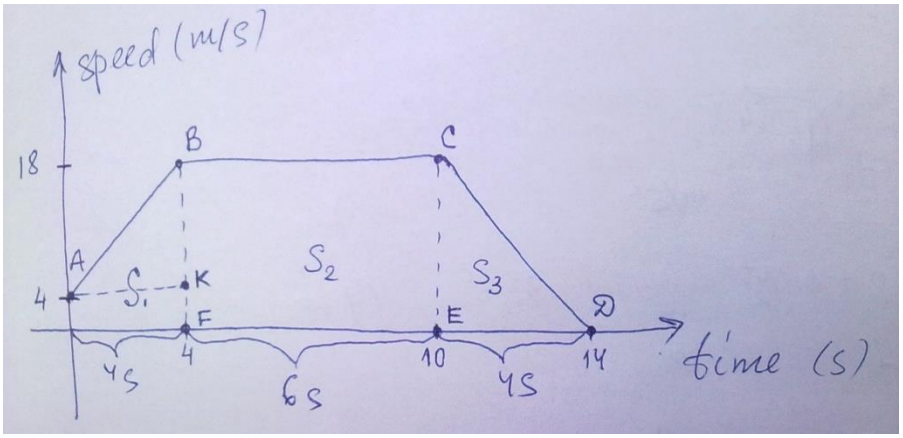
Answer on Question#79521, Physics, Mechanics, Relativity

Question:

A motorcycle starting from 4m/s reaches a maximum speed of 18 m/s in 4s, it continues with this speed for another 6 seconds it is finally brought to rest in another 4 s. Using a graphical method determine
a. Sketch a velocity
b. The acceleration of the car during the first 4s
c. The distance covered by the car when
i. It was accelerating
ii. It was moving with uniform speed
iii. It was decelerating
iv. The total distance for the whole journey.

Solution:

a. A speed-time graph is shown in the figure below.



b. The acceleration of the car during the first 4s equal to the slope of the line AB:

$$a_1 = \frac{BK}{AK} = \frac{18-4}{4} = 3,5 m/s^2$$

c.

i. The distance covered by the car when it was accelerating is equal to the area of quadrangle ABFO. This quadrangle can be represented as two figures what are the rectangle AKFO and the triangle ABK. Then the distance is equal to the sum of the areas AKFO and ABK:

$$s_1 = AF * AO + \frac{1}{2} AK * BK = 4*4 + \frac{1}{2} * 4 * (18-4) = 44 m$$

ii. When the car was moving with uniform speed, the path traversed by car is the area of a rectangle BCEF:

$$s_2 = EF * BF = 6 * 18 = 108\,m$$

iii. In the case of deceleration of the car, we find the travelled distance as the area of the triangle CDE:

$$s_3 = \frac{1}{2} EC * ED = \frac{1}{2} * 18 * 4 = 36\,m$$

iv. The total distance for the whole journey is a sum of all distances passed in three intervals of time:

$$s_{total} = s_1 + s_2 + s_3 = 44 + 108 + 36 = 188\,m$$