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Matakul : Fisika Modern

Tugas 1

- 1.) Sebuah kereta Sri Tanjung bergerak dengan kecepatan 106 km/jam melewati Stasiun Jember Pada pukul 09.00 WIB . Tiga puluh detik kemudian sebuah kilatan cahaya menerpa rel kereta 1 jaraknya dari stasiun tersebut ke arah yang sama.

Dik : $v = 106 \text{ km/jam} = 29,44 \text{ m/s}$

$t = 0 \text{ s}$

$t' = 30 \text{ s}$

$x' = 1 \text{ km} = 1000 \text{ m}$

Dit : a. (x', t') ... ?

b. (x'', t'') ... ?

Jawab : a. $(x', t') = (1000 \text{ m}, 30 \text{ s})$

b. $x'' = x' - vt'$ * $t'' = t' = 30 \text{ s}$

$= 1000 - (29,44)(30)$

$= 1000 - 883,2$

$= 116,8 \text{ m}$

$(x'', t'') = (116,8 \text{ m}, 30 \text{ s})$

- 2.) Dik : $v_b = 15 \text{ m/s}$ (berlawanan arah)

$v_k = 72 \text{ km/jam} = 20 \text{ m/s}$

Dit : $v_{bs} \dots ?$

Jawab : $v_{bs} = v_k - v_b$

$= 20 - 15$

$= 5 \text{ m/s}$

- 3.) Dik : $v_A = 60 \text{ km/jam}$

$v_B = 40 \text{ km/jam}$

Dit : a. $v_{AB} \dots ?$

b. $v_{BA} \dots ?$

Jawab : a. $v_{AB} = v_A - v_B$

$= 60 - 40$

$= 20 \text{ km/jam}$ (searah)

b. $v_{BA} = v_B - v_A$

$= 40 - 60$

$= -20 \text{ km/jam}$ (berlawanan)



4.) Dik: $x' = 5 \text{ m}$

$$v = 36 \text{ km/jam} = 10 \text{ m/s}$$

$$t' = 5 \text{ s}$$

Dit: a. (x', t') ...?

b. (x, t) ...?

Jawab: a. $(x', t') = (5, 5)$

$$\begin{aligned} b. x &= (v \cdot t') + x' & * & t = t' = 5 \text{ s} \\ &= (10 \cdot 5) + 5 \\ &= 55 \text{ m} \end{aligned}$$

5.) Dik: $d = 100 \text{ m}$

$$v_A = 60 \text{ m/s}$$

$$v_P = 80 \text{ m/s}$$

Dit: a. x ...?

b. t' ...?

$$\begin{aligned} \text{Jawab: a.) } t &= \frac{d}{v_P} \\ &= \frac{100 \text{ m}}{80 \text{ m/s}} \\ &= 1.25 \text{ s} \end{aligned}$$

$$\begin{aligned} x &= v_A \cdot t \\ &= 60 \cdot 1.25 \\ &= 75 \text{ m} \end{aligned}$$

$$\begin{aligned} b.) v_y &= v_P \sin \theta \\ &= 80 \sin 53^\circ \\ &= 80 \cdot 0.798 \\ &= 63.84 \text{ m/s} \end{aligned}$$

$$\begin{aligned} t' &= \frac{d}{v_y} \\ &= \frac{100 \text{ m}}{63.84 \text{ m/s}} \\ &= 1.57 \text{ s} \end{aligned}$$

6.) Dik: $C = c$

$$u = u$$

$L = 2L$ (bolak-balik)

Dit: a. t TOTAL ARUS ...?

b. Perbandingan t TOTAL ARUS dengan t TOTAL TEGAK LURUS ...?

Jawab: a.) v berlawanan $= c - u$

$$t \text{ pergi} = \frac{L}{c - u}$$

$$v \text{ searah} = c + u$$

$$t \text{ kembali} = \frac{L}{c + u}$$

$$\begin{aligned} t_{\text{TOTAL ARUS}} &= \frac{L}{c - u} + \frac{L}{c + u} \\ &= \frac{L(c + u) + L(c - u)}{(c - u)(c + u)} \\ &= \frac{Lc + Lu + Lc - Lu}{c^2 - u^2} \\ &= \frac{2Lc}{c^2 - u^2} \end{aligned}$$

$$\begin{aligned} b.) c^2 &= v^2 + u^2 \\ v^2 &= c^2 - u^2 \\ v &= \sqrt{c^2 - u^2} \end{aligned}$$

$$t \text{ Seberang} = \frac{L}{\sqrt{c^2 - u^2}}$$

$$t_{\text{TOTAL TEGAK LURUS}} = 2 \times \frac{L}{\sqrt{c^2 - u^2}}$$

$$t_{\text{TOTAL ARUS}} = \frac{2Lc}{c^2 - u^2}$$

$$t_{\text{TOTAL TEGAK LURUS}} = 2 \times \frac{L}{\sqrt{c^2 - u^2}}$$

$$= \frac{L}{c^2 - u^2} \times \sqrt{c^2 - u^2}$$

$$= \frac{L \sqrt{c^2 - u^2}}{c^2 - u^2}$$

$$= \frac{L}{\sqrt{c^2 - u^2}}$$

$t_{\text{TOTAL ARUS}} (\text{berlawanan} + \text{searah}) > t_{\text{TOTAL TEGAK LURUS}} (\text{Bolok-Balik})$

