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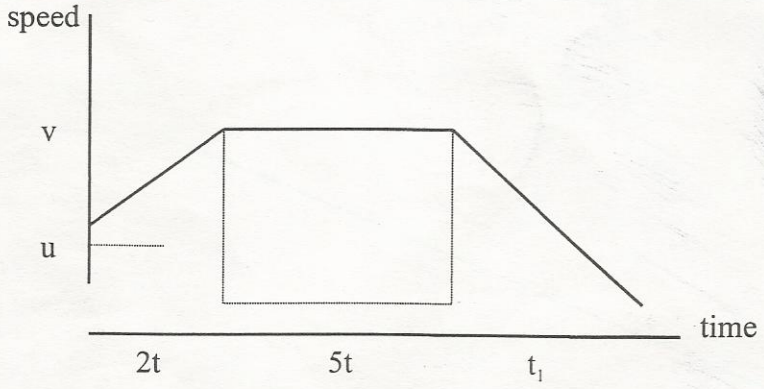
1 (b) A particle travels in a straight line with constant acceleration f for 2t seconds and covers 15 metres. The particle then travels a further 55 metres at constant speed in 5t seconds. Finally the particle is brought to rest by a constant retardation 3f.

(i) Draw a speed-time graph for the motion of the particle.

(ii) Find the initial velocity of the particle in terms of t.

(iii) Find the total distance travelled in metres, correct to two decimal places.

(i)



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(ii)

$$5t\,(v) = 55$$

$$t\,v = 11$$

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$$2t\,(u) + \tfrac{1}{2}(2t)\,(v-u) = 15$$

$$2tu + tv - tu = 15$$

$$tu + tv = 15$$

$$t\,u = 15 - 11$$

$$u = \frac{4}{t}$$

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(iii)

$$\tan\beta = 3\tan\alpha$$

$$\frac{v}{t_1} = \frac{3(v-u)}{2t}$$

$$t_1 = \frac{2tv}{3(v-u)} = \frac{2(11)}{3(\frac{11}{t} - \frac{4}{t})} = \frac{22t}{21}$$

$$\text{total distance} = 15 + 55 + \tfrac{1}{2}\left(\frac{22t}{21}\right)\left(\frac{11}{t}\right)$$

$$= 75.76 \text{ m}$$

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