7. Two trains, A and B, start together from rest, at time $t = 0$, at a station and move along parallel straight horizontal tracks.

Both trains come to rest at the next station after 180 s.

Train A moves with constant acceleration $\frac{2}{3}$ m s^{-2} for 30 s, then moves at constant speed for 120 s and then moves with constant deceleration for the final 30 s.

Train B moves with constant acceleration for 90 s and then moves with constant deceleration for the final 90 s.

(a) Sketch, on the same axes, the speed–time graphs for the motion of the two trains between the two stations.

(3)

(b) Find the acceleration of train B for the first half of its journey.

(5)

(c) Find the times when the two trains are moving at the same speed.

(4)

(d) Find the distance between the trains 96 s after they start.

(5)

(Total for Question 7 is 17 marks)

TOTAL FOR PAPER IS 75 MARKS