

11- Lap Mileage Accumulation Test

KES T – E030

(EST) 1989–11–30

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Supplementary Provisions

Supplementary Documents

1. Scope of Application

This is applied to mileage accumulation test vehicle when mileage accumulation test is executed on chassis dynamo.

2. Unit and Terminology

2.1 Unit: Unit follows the technical standard framing method. (KES A-A001).

2.2 Terminology

(1) Normal acceleration: Throttle openness 75 %

3. Outline of 11-Lap Mode

3.1 Details of 11-lap mode: A cycle of 11-lap mode consists of 11 laps whose length is 6 km (3.7 mile).

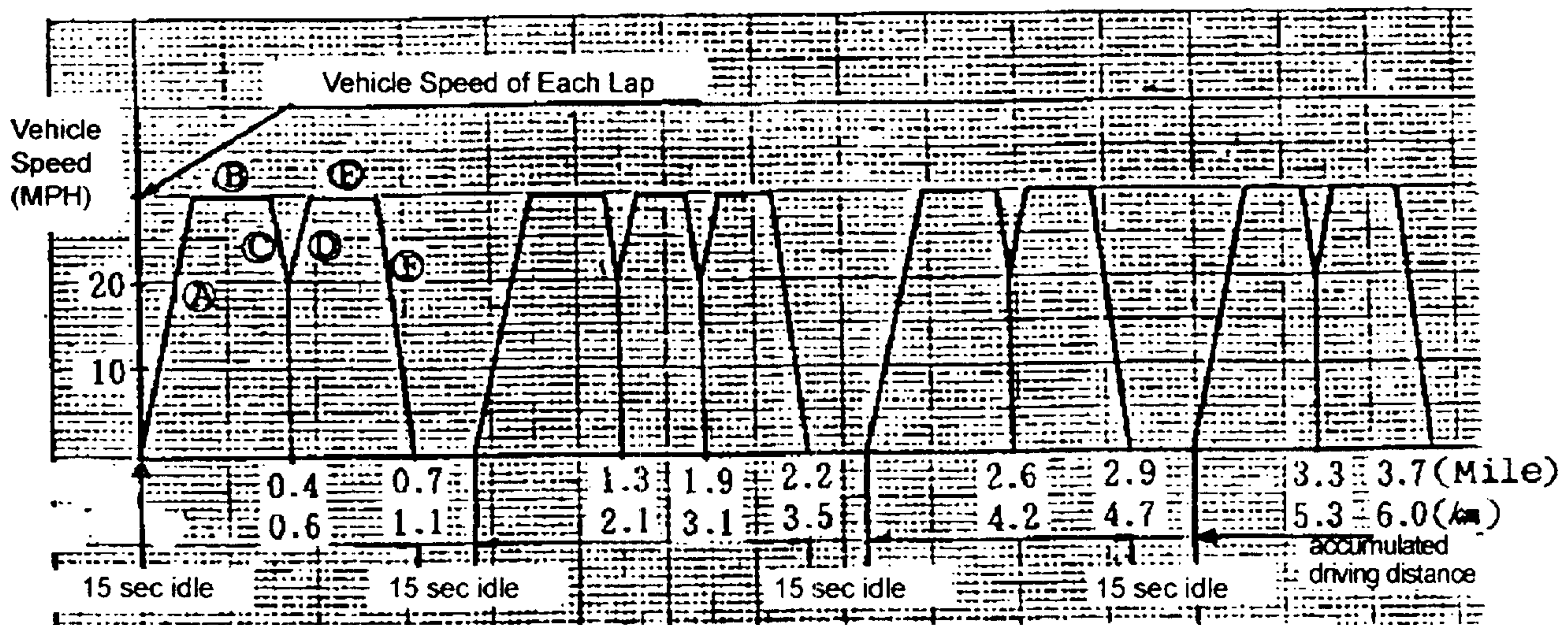
No. of Lap	Lap Speed, MPH(KPH)	Driving Distance MPH(KPH)	Remark
1	40 (64)	3.7 (6.4)	USA - EPA Domestic Environment Protection Agency
2	30 (48)	3.7 (6.4)	
3	40 (64)	3.7 (6.4)	
4	40 (64)	3.7 (6.4)	
5	35 (56)	3.7 (6.4)	
6	30 (48)	3.7 (6.4)	
7	35 (56)	3.7 (6.4)	
8	45 (72)	3.7 (6.4)	
9	35 (56)	3.7 (6.4)	
10	55 (88)	3.7 (6.4)	
11	70 (112)	3.7 (6.4)	USA - EPA Domestic
11	(100)	3.7 (6.4)	Environment Protection Agency

Remark : Notice that the 11th lap speed of USA-EPA differs from one of the Domestic Environment Protection Agency

3.2 Description of each lap

(1) 1st~9th laps : Each of 1st~9th laps consists of driving modes as follows.

Each consists of 9 modes as following figure. (See Fig. 1)



Remark : The vehicle speed of each lap indicates the lap speed of 2.1 clause.

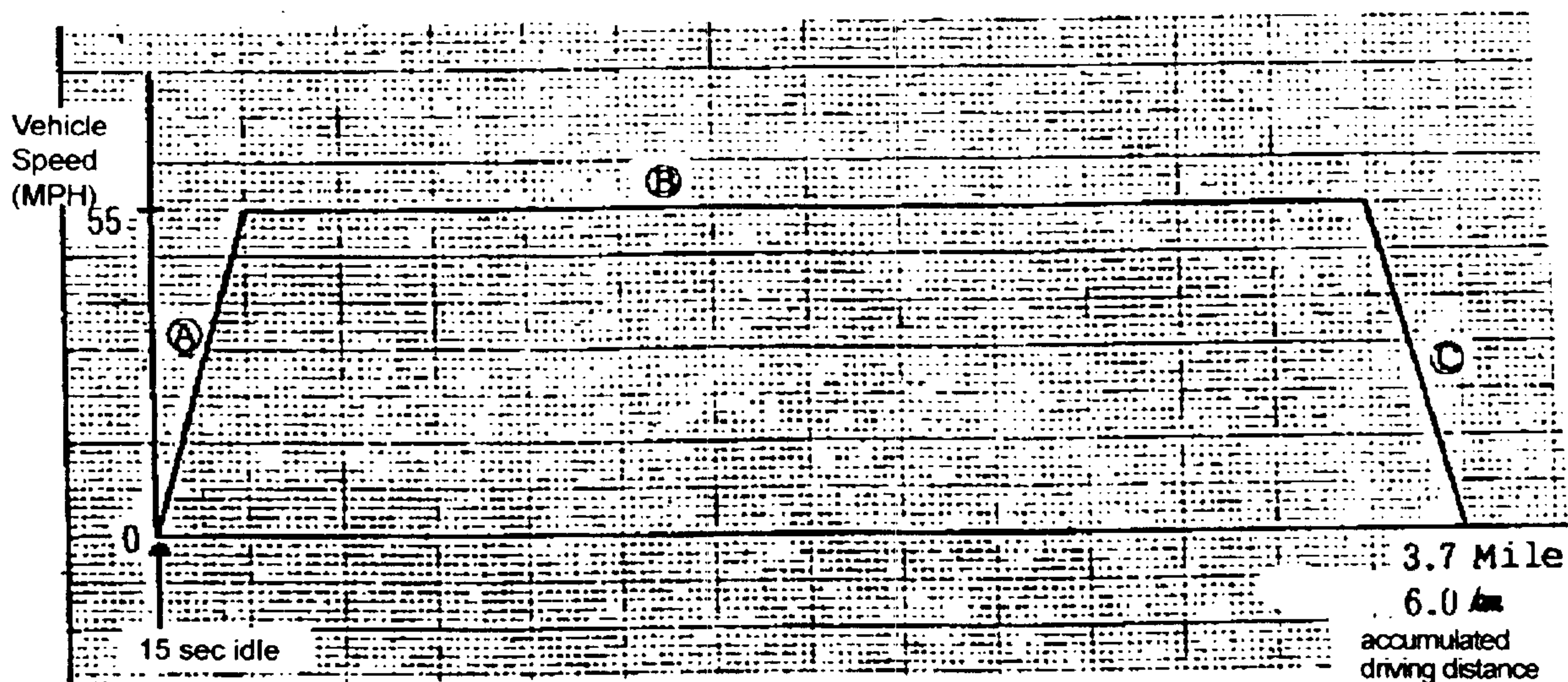
A, D : Normal acceleration

B, E : Constant speed driving

C, F : Normal deceleration

Fig. 1 Basic Characteristic of 11 laps (1st~9th Lap)

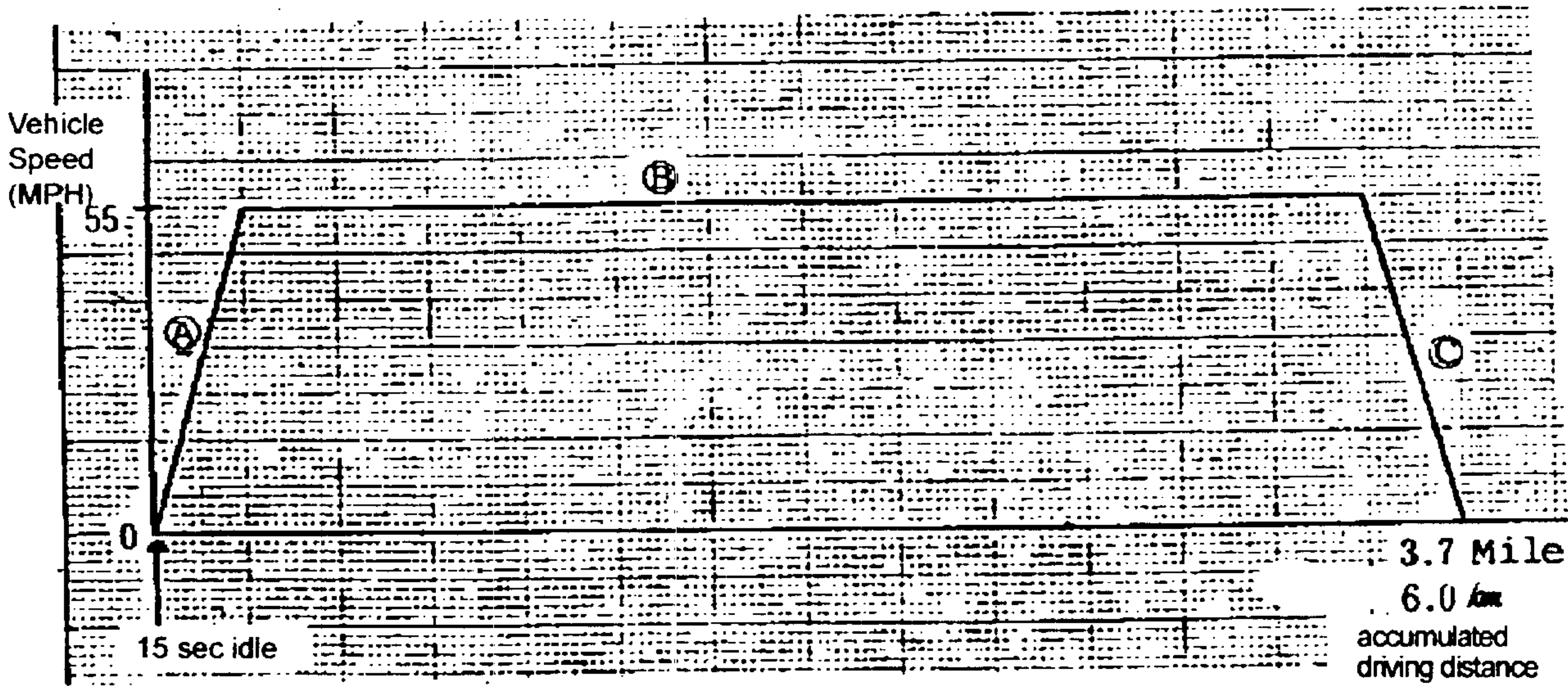
(2) 10th Lap



- A : Normal Acceleration
- B : Constant Speed Driving
- C : Normal Deceleration

Fig. 2 Configuration of 10th Lap

(3) 11th Lap



- A, D : Wide Open Throttle Acceleration
- B, E : Constant speed driving
- C, F : Normal deceleration

Fig. 3 11th Lap

4. Analysis of 11-Lap Mode

Item	No./ Cycle	No./ Mile
Stop	38	0.95
Normal Acceleration	37	0.93
Wide Open Throttle Acceleration	2	0.05

Table (Continued)

Item	No./ Cycle	No./ Mile
Idle Time	555(sec)	13.88(sec)
Normal Deceleration	45	1.13

5. Outline of Framing 11-Lap Mode Cycle

5.1 Cycle framing

- (1) A cycle consists of 11 laps in 2.2 clause. (See Fig. 1)
- (2) Vehicle stop is idle state for 15 sec.
- (3) When mileage accumulation test is performed, repeat the cycle described in Fig.1 until targeted driving distance is reached.

5.2 11-Lap mode cycle framing method

- (1) Find the speed of the vehicle for driving at the point of gear shift.
(buyer recommending specification)
- (2) Calculate normal acceleration, normal deceleration and wide open throttle acceleration (See clause 2.2) on the basis of the vehicle speed found in (1).
- (3) Frame a cycle such as Appendix #1, using speed, acceleration and deceleration calculated in (1), (2).

11 Lap Mileage
Accumulation Mode

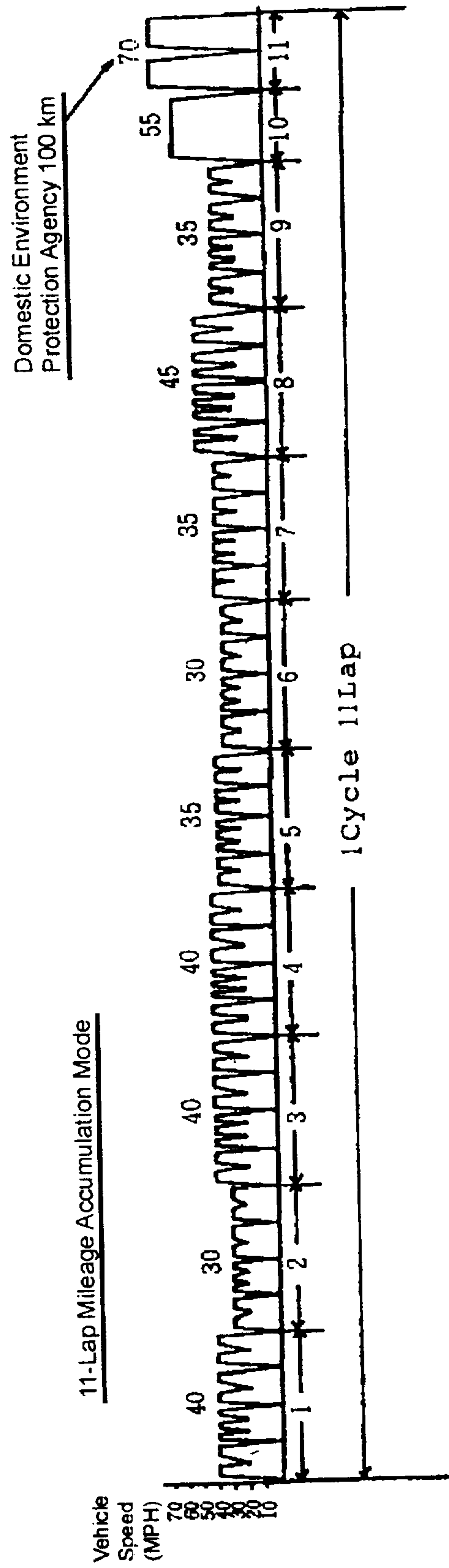


Fig. 4 11-Lap Mode

6. Details of Framing 11-Lap Mode Cycle

6.1. 1~9th laps

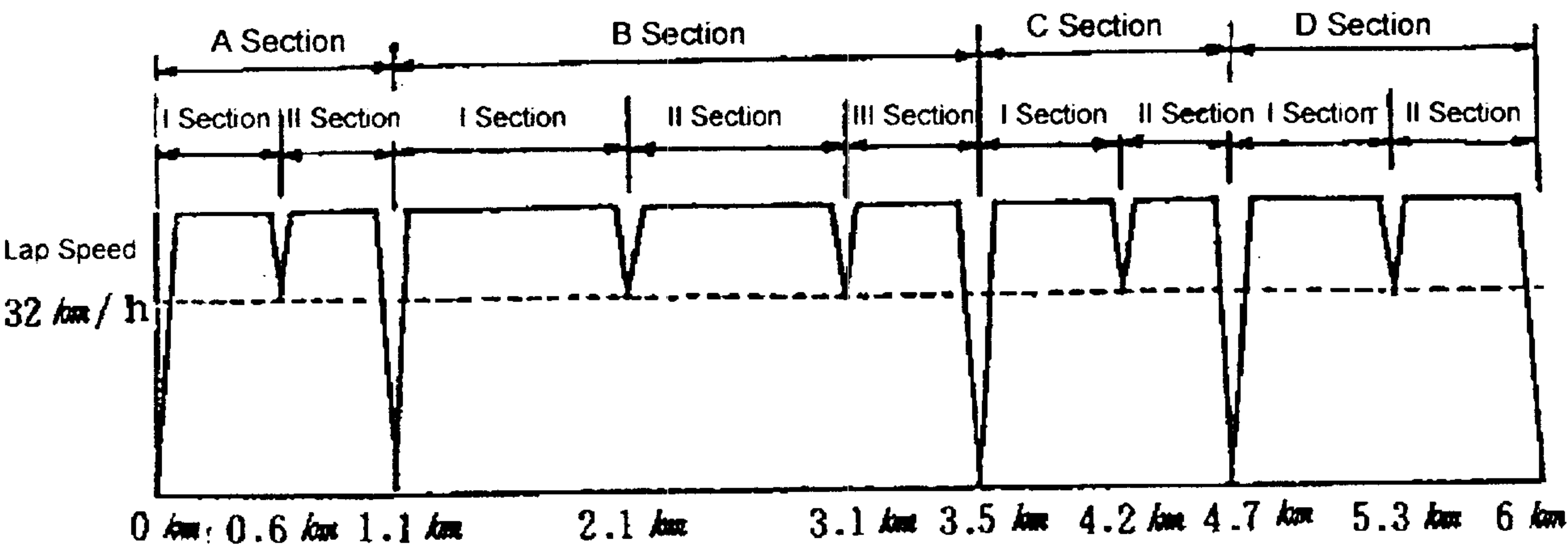


Fig. 5 Configuration Diagram of 1~9 Laps

Vehicle Gear shift Point

Gear shift	Speed(KPH)
1st grade → 2nd grade	26
2nd grade → 3rd grade	45
3rd grade → 4th grade	61
4th grade → 5th grade	48

Remark 1. Vehicle gear shift point described above was recommended in P 031.

(Example)

2. In 11th lap, vehicle gear shift point above was adjusted upward for wide open throttle acceleration.

6.1.1 Lap speed 48 KPH

(1) A Section (See Appendix #2 for Calculation Meathead)

1) I Section

(a) Acceleration (0 → 48 KPH)

$$\begin{array}{lll}
 S_1 = 9 \text{ m} & t_1 = 3.6 \text{ sec} & a_1 = 1.39 \text{ m/sec}^2 \quad (0 \rightarrow 18\text{KPH}) \\
 S_2 = 18.33 \text{ m} & t_2 = 3.0 \text{ sec} & a_2 = 0.741 \text{ m/sec}^2 \quad (18 \rightarrow 26\text{KPH}) \\
 S_3 = 73.96 \text{ m} & t_3 = 7.5 \text{ sec} & a_3 = 0.704 \text{ m/sec}^2 \quad (26 \rightarrow 45\text{KPH})
 \end{array}$$

(b) 45 → 48 KPH

$$\begin{aligned}
 S_4 &= \frac{1.5 \times (48+45)}{2 \times 3.6} = 19.38 \text{ m} \\
 t_4 &= 1.5 \text{ sec} \quad S = \frac{t \cdot (V_1 + V_2)}{2 \times 3.6} \\
 a_4 &= \frac{48 - 45}{1.5 \times 3.6} = 0.556 \text{ m/sec}^2 \\
 s_{\text{total}} &= s_1 + \dots + s_4 = 120.67 \text{ m}
 \end{aligned}$$

(c) Deceleration (48 → 32 KPH)

$$\begin{aligned}
 S_6 &= \frac{4.5 \times (32+48)}{2 \times 3.6} = 50 \text{ m} \\
 a_6 &= \frac{32 - 48}{4.5 \times 3.6} = -0.988 \text{ m/sec}^2 \\
 t &= 4.5 \text{ sec}
 \end{aligned}$$

(d) Constant speed driving (48 KPH)

$$\begin{aligned}
 S_5 &= 600 - (50 + 120.67) = S_1 + S_2 + S_3 + S_4 + S_6 \\
 &= 429.33 \text{ m} = Vt \\
 t_5 &= \frac{3.6 \times 429.33}{48} = 32.2 \text{ sec}
 \end{aligned}$$

2) II Section

(a) Acceleration (32 → 48 KPH)

$$\begin{aligned}
 t_7 &= \frac{48 - 32}{0.732 \times 3.6} = 6.072 \approx 6.1 \text{ sec} \\
 S_7 &= \frac{6.1 \times (48 + 32)}{2 \times 3.6} = 67.78 \text{ m}
 \end{aligned}$$

$$a_7 = \frac{48 - 32}{6.1 \times 3.6} = 0.73 \text{ m / sec}$$

(b) Deceleration (48 → 0 KPH)

a) 48 → 24 KPH

$$t_9 = \frac{24 - 48}{-0.926 \times 3.6} = 7.20 \text{ sec}$$

$$S_9 = \frac{7.2 \times (48 + 24)}{2 \times 3.6} = 72.0 \text{ m}$$

$$a_9 = \frac{(24 - 48)}{7.2 \times 3.6} = -0.926 \text{ m / sec}$$

b) 24 → 0 KPH

$$t_{10} = \frac{-24}{-0.952 \times 3.6} = 7.0 \text{ sec}$$

$$S_{10} = \frac{7.0 \times 24}{2 \times 3.6} = 23.33 \text{ m}$$

(c) Constant speed driving (48 KPH)

$$S_8 = 500 - (72 + 23.33 + 67.78) = 336.89 \text{ m} = Vt$$

$$t_8 = \frac{3.6 \times 336.89}{48} = 25.27 \text{ sec}$$

(2) B Section

1) I Section

(a) Acceleration (0 → 48 KPH)

Same as 1) (a) in clause (1)

(b) Deceleration (48 → 32 KPH)

Same as 1) (b) in clause (1)

(c) Constant speed driving (48 KPH)

$$S = 1000 - (50 + 120.67) = 829.33 \text{ m} = Vt$$