

Given :	Au. travel time	22.8	sec	T_a
	Platoon Disp-factor	0.139		α
	Travel time factor	0.878		β
	Update interval	10	sec	δt

Soln. Smoothing factor.

$$\begin{aligned}
 f &= \frac{1}{1 + \alpha \cdot \beta \cdot \frac{T_a}{\delta t}} \\
 &= \frac{1}{1 + 0.139 \times 0.878 \times (22.8/10)} \\
 &= 0.7823
 \end{aligned}$$

Minimum Travel time $T = \beta \cdot T_a$

$$= 0.878 \times 22.8$$

$$= 20.0184$$

$$\approx 20 \text{ (multiple of } t = 10 \text{ sec)}$$

$$q_{t-d}^d = q_{t-T}^u * f + q_{t-dt}^d (1-f)$$

t	q_t^u	$q_{t-20}^u * f$	$q_{t-10}^d * (1-f)$	q_t^d
10	20	0	0	0
20	10	0	0	0
30	15	20×0.783	0	5.646
40	18	10×0.783	$+ 15.646 \times (1 - 0.783) = 11.229$	
50	14	15×0.783	$11.229(1 - 0.783) = 14.179$	
60	12	18×0.783	$+ 14.179(1 - 0.783) = 17.168$	
70	0	14×0.783	$+ 17.168(1 - 0.783) = 14.689$	
80	0	12×0.783	$+ 14.689(1 - 0.783) = 12.585$	
90	0	0×0.783	$+ 12.585(1 - 0.783) = 2.739$	

EXCEL Implementation

Given	Average travel time			Ta	22.8000
	Platoon dispersion factor			a	0.1390
	Travel time factor			b	0.8780
	Update interval			dt	10
Solution	Smoothing factor			f	0.7823
	Minimum travel time			T	20.0184
	Minimum travel time (rounded)			T	20
	t	UP (qut)	qu(t-T)*f	qd(t-dt)	DN (qdt)
	10	20	0.0000	0.0000	0.0000
	20	10	0.0000	0.0000	0.0000
	30	15	15.6463	0.0000	15.6463
	40	18	7.8232	3.4060	11.2291
	50	14	11.7347	2.4444	14.1791
	60	12	14.0817	3.0866	17.1683
	70	0	10.9524	3.7373	14.6897
	80	0	9.3878	3.1977	12.5855
	90	0	0.0000	2.7397	2.7397
	100	0	0.0000	0.5964	0.5964
	110	0	0.0000	0.1298	0.1298
	120	0	0.0000	0.0283	0.0283
	130	0	0.0000	0.0062	0.0062
	140	0	0.0000	0.0013	0.0013
	150	0	0.0000	0.0003	0.0003
	160	0	0.0000	0.0001	0.0001
	170	0	0.0000	0.0000	0.0000
	180	0	0.0000	0.0000	0.0000
	190	0	0.0000	0.0000	0.0000
	200	0	0.0000	0.0000	0.0000
	210	0	0.0000	0.0000	0.0000
	220	0	0.0000	0.0000	0.0000
	230	0	0.0000	0.0000	0.0000
	240	0	0.0000	0.0000	0.0000

	Total	89	Should match	89.0000
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