PROBLEMS

6-1. A set of dual tires is spaced at 34 in. center to center and carries a total load of 45,000 lb with a tire pressure of 100 psi. Assuming the pavement to be a homogeneous half-space, determine the ESWL for a pavement of 25 in.

6-2. A full-depth asphalt pavement is loaded by a set of dual wheels, each weighing 8000 lb and spaced at 20 in. on centers. The hot mix asphalt has a thickness of 10 in. and an elastic modulus of 250,000 psi; the subgrade has an elastic modulus of 10,000 psi. Both layers are incompressible with a Poisson ratio of 0.5. If the dual wheels and the equivalent single wheel have the same contact radius of 6 in., determine the ESWL based on (a) equal interface deflection and (b) equal tensile strain at the bottom of asphalt layer.

6-3. A pavement is subjected to the single-axle loads shown in Table P6.3. Determine the ESAL for a design period of 20 years using AASHTC equivalent axle load factors and

TABLE P6.3

Axle load (kip)	Number per day	Axle load (kip)	Number per day	Axle load (kip)	Number per day
12	200.0	20	47.2	28	2.9
14	117.4	22	21.4	30	1.2
16	84.5	24	12.9	32	0.7
18	61.4	26	6.1	34	0.3

6-4. Based on P6.3, discuss the effect of p_t on EALF

6-5. Estimate the equivalent 18-kip single-axle load applications (ESAL) for a four-lane pavement (two lanes in each direction) of a rural interstate highway with a truck count of 1000 per day (including 2-axle, 4-tire panel, and pickup trucks), an annual growth rate of 5%, and a design life of 20 years.

6-6 Table P6.6 is abstracted from a W-4 table on tractor semitrailer combinations for a loadometer station from July 16 to August 8. It is assumed that the traffic during the recorded period represents the average over the entire year. If the pavement to be constructed has a structural number SN of 5, estimate the ESAL of the tractor semitrailer combinations during the first year in two directions over all lanes based on a p_t of 2.5.

6-7 Same as Problem 6-6 but for a rigid pavement with a concrete thickness of 9 in.

Table P6.6

Traffic Data

Single Axle		Tandem Axle	
Axle Load (kips)	Axles/day/1000 trucks	Axle Load (kips)	Axles/day/1000 trucks
≤8	1200	≤14	220
8–12	240	14–20	200
12–16	200	20–26	180
16–18	160	26–30	200
18–20	60	30–32	5
20–22	15		
22–24	8		

ADT: 12,000 vehicles per day (2-directional)
% Heavy vehicles (in loadometer study) = 14%

6-9. Based on the axles weighed and the axles and vehicles counted, as shown in Table P6.6 determine the truck factor of all tractor semitrailer combinations for a flexible pavement with SN = 5 and p_t = 2.5.

6-10. Same as Problem 6-9 but for a rigid pavement with D = 9.