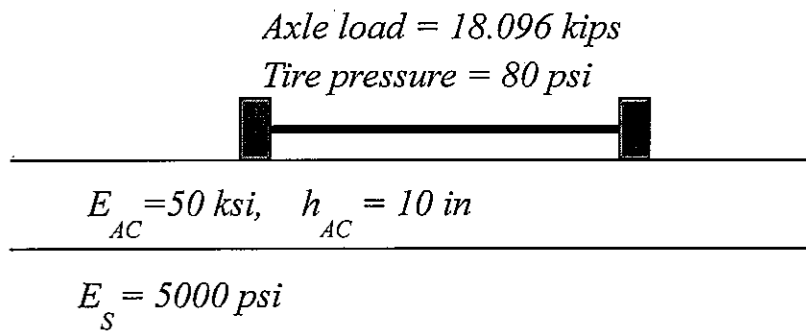


1. Please determine the maximum deflection and maximum vertical stress in subgrade. (2x10%)



2. Use Westergaard solution to analyze the maximum stresses of a concrete slab(150in×210in×14in) resting on Winkler foundation($k=200\text{psi/in}$) and interiorly loaded with a single wheel, the results are different from the results of finite element analysis by 15%.
(a) calculate the maximum tensile stress in the concrete slab. (7%)
(b) calculate the maximum deflection in the concrete slab(7%)
(d) calculate the maximum compressive stress in the subgrade. (6pt)
3. According to AASHO Road Test, a flexible pavement with SN=4 subjected a single-axle load of 20 kip and a tandem-axle load of 40 kip.
(a) Based on a $p_t=2.5$, determine which axle is more destructive to the pavement. (10%)
(b) Try to explain the mechanism causes result in (a) (10%)
4. Please show the computation of stress invariant in the table below. (10%), and determine the type of the material (granular or fine-grained) (10%)

Confining pressure σ_3 (psi)	Deviator stress σ_d (psi)	Recoverable deformation (0.001 in.)	Recoverable strain $\epsilon_r (\times 10^{-3})$	Resilient modulus $M_R (\times 10^3 \text{ psi})$	Stress invariant θ (psi)
20	1	0.264	0.066	15.2	61
	2	0.496	0.124	16.1	62
	5	1.184	0.296	16.9	65
	10	2.284	0.571	17.5	70
	15	3.428	0.857	17.5	75
	20	4.420	1.105	18.1	80

5. Please explain the theoretical and algorithm differences of backcalculation between flexible pavement and rigid pavement. (20%)