CE 442
CONSTRUCTION AND MAINTENANCE OF HIGHWAYS AND AIRPORTS

HW No. 5

You are requested to design the structural layers for Jubail Expressway (Dammam - Dhahran). The design Period is 20 years. The traffic data was given in homework no.1. Asphalt concrete layers are 12 cm and cost 120$/yd^3 with a resilient modulus of 6×10^5 psi. Granular base must have a minimum CBR of 100 and cost 12$/yd^3 while selected subbase CBR should be 80 min and cost 5$/yd^3. The resilient modulus for subgrade is 5000 psi for 5-months and 9000 psi for the rest of the year.

Use AASHTO design method if the expected serviceability loss (Δ psi) is 2.0. Calculate the cost of construction (present value) if the expected traffic growth is 3 %, discount rate is 2.5 %,terminal serviceability of 3.0, shoulder are not full depth at a cost of 60 $/ft and drainage pipe at a cost of 40$/ft. The maintenance is expected to start at the 2nd year at yearly increment of 1$/ft.

Design the expressway using both manual solution and computerized solution (DNPS86). The program is available on the course web and can be downloaded from downloads.