

Birzeit university

Civil engineering department – highway engineering

Midterm exam

Q1 : determine the saving value when changing the degree of curvature from 10° to 4° considering urban highway with 45 mph average running speed, 3600 pc/hour peak hour volume, 0.5-mile length, 6% discount rate, and 30-year analysis period .

Q2 : Given : 2-lane approach with 320 pcphpl at urban signalized intersection with 100 sec cycle length. Determine the present value off stopping savings that result from increasing the green time from 30 to 60 seconds assuming 0.5 saturation degree, 35mph approach speed, 6% discount rate, and 30-years analysis period .

Q3 : the initial investment cost of project B exceeds that of project A by \$3.5 million, the annual maintenance and operation cost of project A exceeds that of project B by \$0.1 million, and the annual user cost of project A exceeds that of project B by \$0.6 million. Determine which project is more feasible considering 6% discount rate, 30-year analysis period, and using (B/C) ratio .

Q4 : Given : 96- ft skid marks measured for a vehicle travelling with 45mph speed and collided with another vehicle at unknown speed. Determine the unknown speed (mph) considering deceleration under skidding and -30% highway gradient .

Q5 : A compound curve is to be introduced to two main tangents with 62° intersection angle. The large curve has 5° degree of curvature with 38° central angle. Determine the PC station assuming 520.75m PI station, and $R_s=200$ m.

Q6 : A vertical obstruction is located 18 ft from travel way edge on a circular curve with 8° degree of curvature. Find the appropriate design speed considering two-lane highway with 12 ft lane width.

Q7 : A proposed vertical curve ($G_1=5\%$, $G_2=3\%$, VPI sta = 725.82 ft, VPI Elev = 217.16 ft) is to cross at grade an existing roadway at station 511.95 ft with 192.43 ft elevation. Find the required curve length .

Q8 : two-lane highway with 12 ft lane width and 2% cross slope. Draw and define the super-elevation profile assuming 60-ft tangent runoff (TR), 150ft runoff length, and 612.78ft PC station .