

Sunday, August 14, 2011

Time Limit: 120 Minutes

Instructor: Dr. Wa'el M. Albawwab



University of Palestine

College of Applied Engineering
& Urban Planning

EGGC4228 Transportation Engineering II

Open-Book Final Exam

Answer All Questions

Q1- A vehicle is flowing at a design speed of 65 mph on a level highway. The highway has two lanes with 20 ft width for each lane. An equal tangent vertical curve alignment is to be attached to the highway at a 102.5 ft elevated PVC to connect an ascending grade of 3% with a descending grade of 1.2%. The local code imposes reducing the vehicle speed to 55 mph at the end of the ascending portion of the vertical curve. Determine the required elevation of PVI that fulfills the local code regulations. **(10 Marks)**

Q2- A horizontal curve for a four-lane highway section in an urban area has a design speed of 60 mph and an assigned middle ordinate of 19 ft. What is the recommended radius of this curve in order to avoid sight distance problems? Assume that the highway surface is wet concrete ($f = 0.29$) and descending at 5%, and the driver has a brake reaction time of 0.9 seconds. **(10 Marks)**

Q3- If a stopping sight distance of 122 m is to be maintained on an equal tangent sag vertical curve with tangent grades of descending 3% and 0%, determine the required length of the curve. Assume a headlight height of 61 cm, and a beam upward divergence angle of 1° . **(10 Marks)**

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Open-Book Final Exam - Continued

Q4- A concrete rigid pavement is constructed on 7 in. thick subbase with an elastic modulus of 15 ksi, the roadbed soil resilient modulus 5 ksi, and the bedrock depth is about 10 ft. If the projected slab thickness is 7 in. and the potential loss of subbase support is zero, determine:

- (a) the effective modulus of subgrade reaction **(5 Marks)**
- (b) the corresponding average effective relative damage **(5 Marks)**

Q5- Use the 1993 AASHTO design method to determine the layer depths of a dense graded HMA major urban highway with a crushed stone base and a granular subbase. The highway has 3 lanes in each direction and the cumulative ESAL for a 15 years design period is 10×10^6 . The area has a good drainage quality with 5% of the time the moisture level is approaching saturation. The average annual relative damage for the roadbed soil is 0.2. The subbase has a CBR value of 80% and the resilient modulus of the untreated base material is 40 ksi. Take into consideration a reliability level of 90% and an overall standard deviation of 0.45. **(20 Marks)**

Good Luck