

Thursday, March 29, 2012

Time Limit: 120 Minutes

Instructor: Dr. Wa'el M. Albawwab



University of Palestine

College of Applied Engineering  
& Urban Planning

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## ECGD4228 Transportation Engineering II

### Open-Book Mid-Term Exam

#### Answer All Questions

**Q1-** Derive a mathematical expression relating the total elevation at a corresponding horizontal distance from the beginning of the vertical curve to the vertical distance from the initial tangent to the vertical alignment curve line. **(2 Marks)**

**Q2-** 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. Find the required elevation of PVI that fulfills the local code regulations. **(4 Marks)**

**Q3-** There is a high risk on a level major highway that a sudden obstacle becomes visible to a driver at a distance of 52 m. Assume a perception reaction time of 0.9 sec., a design speed of 75 km/hr, and a friction factor of 0.32 to determine:

- (a) the risk of accidents **(2 Marks)**
- (b) the accident impact velocity **(2 Marks)**
- (c) the suitable design speed **(2 Marks)**

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**Open-Book Mid-Term Exam - Continued**

**Q4-** 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. **(4 Marks)**

**Q5-** Consider the details listed below for a vehicle moving at 50 mph is slowing traffic on a two-lane highway. What passing sight distance is necessary for a passing maneuver to be carried out safely? Assume that the passing vehicle accelerates to passing speed before moving into the left lane. **(4 Marks)**

- Passing vehicle driver's perception/reaction time = 2.5 sec
- Passing vehicle's acceleration rate = 1.47 mph/sec
- Passing speed of passing vehicle = 60 mph
- Speed of slow vehicle = 50 mph
- Speed of opposing vehicle = 60 mph
- Length of passing vehicle = 22 ft
- Length of slow vehicle = 22 ft
- Clearance distance between passing and slow vehicles at lane change = 20 ft
- Clearance distance between passing and slow vehicles at lane re-entry = 20 ft
- Clearance distance between passing and opposing vehicles at re-entry = 250 ft

**Good Luck**