***Birzeit University - Faculty of Engineering***
***Department of Civil Engineering***
***Transportation Engineering - ENCE 431***

Instructors: Dr. Faisal Awadallah Spring 2021

***Midterm Exam (Part 2 out 70%) online***

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**Copy the pledge below in red and sign your name below it in the first page of the answer sheet**

**I PLEDGE NOT to use any help from anyone and not to communicate about the exam through any form or media**

***Question 1: (30 marks)***

Group A: Last two digits of the student number 10-34 (inclusive)

Given the length of vertical curve is 600 meters, the station of PVC is 225+16.0m and the elevation of PVI at the intersection of the two tangents is 620.00m, if G1 = +2.0% and G2 = -1.2%, determine:

a) (18 marks) The elevation of station 240 + 00
b) (12 marks) The station and elevation of the highest and lowest points on the vertical curve

Note: Use 20-meter stations

Group B: Last two digits of the student number 35-59 (inclusive)

Given the length of vertical curve is 800 meters, the station of PVT is 225+16.0m and the elevation of PVI at the intersection of the two tangents is 620.00m, if G1 = - 2.0% and G2 = -1.2%, determine:

a) (18 marks) The elevation of station 200 + 9.5
b) (12 marks) The station and elevation of the highest and lowest points on the vertical curve

Note: Use 20-meter stations

Group C Last two digits of the student number 60-84(inclusive)

Given the length of vertical curve is 650 meters, the station of PVC is 210+6.0m and the elevation of PVT is 620.00m, if G1 = - 2.0% and G2 = +1.6%, determine:

a) (18 marks) The elevation of station 230 + 15.5
b) (12 marks) The station and elevation of the highest and lowest points on the vertical curve

Note: Use 20-meter stations

Group D: Last digit of student number 85-99 and 00-09 (inclusive)

Given the length of vertical curve is 950 meters, the station and elevation of PVT are 210+6.0m and 620.00m respectively, if G1 = - 2.0% and G2 = + 2.8%, determine:

a) (18 marks) The elevation of station 200 +1.5
b) (12 marks) The station and elevation of the highest and lowest points on the vertical curve

Note: Use 20-meter stations

***Question 2: (25 marks)***

Group A: Last digit of the student number is 0 & 1

Due to roadside trees the available sight distance on a road segment 80 meters. Given the wet pavement coefficient of friction of 0.35 and 2% downgrade, what should be the design speed in km/h (maximum safe speed)?

Group B: Last digit of the student number is 2 & 3

Due to roadside trees the available sight distance on a road segment 70 meters. Given the wet pavement coefficient of friction of 0.3 and 2% upgrade, what should be the design speed in km/h (maximum safe speed)?

Group C: Last digit of the student number is 4 & 5

Due to roadside trees the available sight distance on a road segment 90 meters. Given the wet pavement coefficient of friction of 0.38 and 3% upgrade, what should be the design speed in km/h (maximum safe speed)?

Group D: Last digit of the student number is 6 & 7

Due to roadside trees the available sight distance on a road segment 60 meters. Given the wet pavement coefficient of friction of 0.31 and 5% downgrade, what should be the design speed in km/h (maximum safe speed)?

Group E: Last digit of the student number is 6 & 7

Due to roadside trees the available sight distance on a road segment 110 meters. Given the wet pavement coefficient of friction of 0.28 and 1% downgrade, what should be the design speed in km/h (maximum safe speed)?

***Question 3: (15 marks)***

Group A: Last digit of the student number is 1 & 2

What is the desirable length of a railroad spiral for a design speed of 150km/h and most comfortable passenger intercity trains using equilibrium elevation of 15cm and unbalance elevation of 10cm according to the American Railway Engineering Association (AREA)?

Group B: Last digit of the student number is 3 & 4

What is the desirable length of a railroad spiral for a design speed of 130km/h and most comfortable passenger intercity trains using equilibrium elevation of 12cm and unbalance elevation of 11cm according to the American Railway Engineering Association (AREA)?

Group C: Last digit of the student number is 5 & 6

What is the desirable length of a railroad spiral for minor short distance routes of passenger intercity trains for a design speed of 80km/h and using equilibrium elevation of 12cm and unbalance elevation of 9.5cm according to the American Railway Engineering Association (AREA)?

Group D: Last digit of the student number is 7 & 8

What is the desirable length of an urban railroad spiral using equilibrium elevation of 14cm, unbalance elevation of 8cm, and a design speed of 100km/h according to the American Railway Engineering Association (AREA)?

Group E: Last digit of the student number is 9 & 0

What is the desirable length of an urban railroad spiral using equilibrium elevation of 15cm, unbalance elevation of 9.0cm, and a design speed of 95km/h according to the American Railway Engineering Association (AREA)?

***GOOD LUCK***