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

Instructors: Dr. Faisal Awadallah Fall 2020

Midterm Exam (Open Book)

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)

Given a length of vertical curve is 600 meters, and information in the table below for four different groups of students based on specific values within each student's number.

Students specific groups based on last two numbers from the left (example of number in red and bold: 1161840)	PVI station	PVI elevation of the intersection of the two tangents	G_1	G_2
A = Between 00 and 24 (inclusive)	125+11.00	1955.00	+2.10	-1.80
B = Between 25 and 49 (inclusive)	124+7.50	1955.9	-2.20	+2.60
C = Between 50 and 74 (inclusive)	126+18.00	1942.10	+1.50	+2.70
D = Between 75 and 99 (inclusive)	127+2.50	1961.20	+2.70	+1.50

Determine

a) (18 marks) The elevation of station 115 + 16.00
b) (12 marks) The Station and elevation of the highest and lowest points on the vertical curve

Assume: 20 meter stations

Question 2: (30 marks)

Give the design speed of an inter-city railroad of "X" km/h and curve radius of 2500 meters, rail gauge (centerline to centerline) equal 1.40 meter, and recommended maximum operational speed is "Y" km/h (see table below of "X" and "Y" values for various groups of students), Determine

a) (10 marks) The equilibrium elevation in millimeters
b) (10 marks) The recommended unbalanced elevation in millimeters
c) (10 marks) The recommended minimum operation speed in km/h

Values of "X" and "Y" for various groups of students

Students fifth and sixth numbers from the left (example of number in red and bold: 116184**0**)	Design Speed "X" (km/h)	Maximum Operational Speed "Y" (km/h)
A = Between 00 and 33 (inclusive)	200	250
B = Between 34 and 67 (inclusive)	190	230
C = Between 68 and 99 (inclusive)	175	210

Question 3: (30 marks)

a) (18 marks) A railroad horizontal curve of length 800 meters and length of spiral is 105 meters and had an equilibrium elevation of 120 mm. Also given the station 125+09.50m (20 meter stations) has same elevation for both rails equal to 60.99m, if the Tangent to Spiral (TS) is at station "X" and the grade from Station 125+09.5 until Spiral Tangent (ST) station is "Y" (See values of "X" and "Y" for various students' groups in the table below), determine

i) (6 marks) The elevation of inner and outer rail at station 133+05.50
ii) (6 marks) The elevation of inner and outer rail at station 148+19.51
iii) (6 marks) The elevation of inner and outer rail at station 178+10.00

Students fifth and seventh numbers from the left (example of number in red and bold: 1161**8**4**0** the number is **80** in this example)	Tangent to Spiral (TS) Station "X"	The grade of the entire rail section (from station 125+09.50 to Spiral Tangent (ST) "Y"
A = Between 00 and 24 (inclusive)	130 + 11.50	-0.50%
B = Between 25 and 49 (inclusive)	130 +18.70	-0.80%
C = Between 50 and 74 (inclusive)	129 + 17.50	+0.25%
D = Between 75 and 99 (inclusive)	131 + 00.00	+0.75%

b) (12 marks) Given an urban railroad line (a rail transit line) with a design speed of 80km/h and tangent slope as given in the table below for various students' groups, determine minimum required length of vertical curve (show and check your work)

Students fifth and sixth numbers from the left (example of number in red and bold: 1161**84**0)	G_1	G_2
A = Between 00 and 24 (inclusive)	-5%	-2%
B = Between 25 and 49 (inclusive)	-1%	+1.7%
C = Between 50 and 74 (inclusive)	+2%	-0.5%
D = Between 75 and 99 (inclusive)	+1.8%	+4.1%

Question 4: (10 marks)

Briefly explain railroad terminal platform and briefly outline the main factors that influence each of the length, width and height of the platform

Note: No groups for this question, the same for all students in the two sections.

GOOD LUCK