Course No: CIVL 4330
Course Title: Roads and Transportation Engineering II
Date: 10/03/2019
No. of Questions: (2)
Time: 1 hr
Using Calculator (Yes)

University of Palestine

First Midterm Exam
Second Semester
2018/2019
Total Grade: 15

Instructor Name: _____
Student No.: _____
Student Name: _____
College Name: Engineering
Dep. / Specialist: Civil Engineering
Using Dictionary (No)

Answer All Questions

First Question 10/15

a- Choose the correct answer showing the required calculations

1. If a 60 m^3 material before excavation occupied up to 54 m^3 after excavation and compaction, this material has a shrinkage factor equals to……. (A) 15 % (B) 10% (C) 20% (D) 12%	
2. The planimetered areas in m^2 of two side-hill cross sections 50 m apart of a proposed highway are F112 and F78 respectively. The quantity of earthwork in m^3 is …….. (A) 4570 (B) 4750 (C) 5470 (D) 5740	
3. A vertical curve is to be designed to join a -4% grade with a +2% grade at a section of a two-lane highway. If the design speed of the highway is 70 mi/h, a perception-reaction time of 2.5 sec and deceleration rate for braking is 11.2 ft /sec^2, determine the stopping sight distance. (A) 788 ft (B) 877 ft (C) 787 ft (D) 878 ft	
4. Given that the overhaul price is \$10/yd^3 station, what will be the extra compensation that must be paid to a contractor if he moves 500 yd^3 of soil to an overhaul distance of 200 ft? (A) \$1000,000 (B) \$100,000 (C) \$10,000 (D) \$1,000	

5. An embankment is formed on ground which is level transverse to the embankment. The width of formation is 10 m and the side slopes are 1 vertical to 2 horizontal. The depths at the center lines of the two sections 20 m apart are 2.5 and 3.0 m respectively. The volume of fill involved in this length in m^3 is …… (A) 855 (B) 900 (C) 955 (D) 1000	

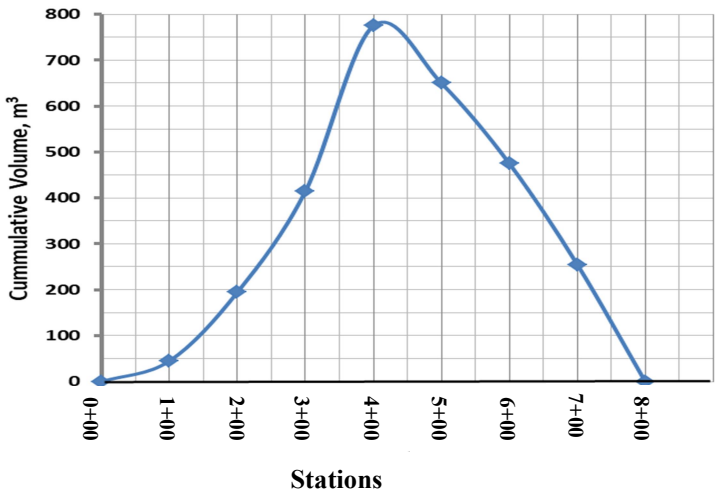
Second Question 5/15

a- State if the following sentences are true (T) or false (F) **(2 marks)**

1.	Highways are classified according to their functions in terms of the service they provide as rural or urban roads.	
2.	Curbs are used mainly on rural highways to delineate pavement edges and pedestrian walkways.	
3.	Steep grades affect not only the performance of heavy vehicles but also the performance of passenger cars.	
4.	The drainage criterion for sag vertical curves must be considered when the road is curbed.	

2- A roadway section is 240 m long (8 stations). The free-haul distance is 120 m. Overhaul cost is \$15/m^3 station. (3 marks)

Station	Ordinate (m3)
0+00	0
1+00	45
2+00	195
3+00	415
4+00	775
5+00	650
6+00	475
7+00	255
8+00	0



Determine the extra compensation that must be paid to a contractor to balance the cut and fill

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Useful Formulae

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Stopping Sight Distance

$$SSD = 0.278\,Vt + \frac{u^2}{254\left(\frac{a}{9.81} \pm G\right)} \quad (metric)$$

$$SSD = 1.47\,Vt + \frac{u^2}{30\left(\frac{a}{32.2} \pm G\right)} \quad (US\ cust.)$$

Crest Vertical Curve

$$L_{min} = 2S - \frac{658}{A} \quad \text{(for S > L)} \quad (metric)$$

$$L_{min} = 2S - \frac{2158}{A} \quad \text{(for S > L)} \quad (US\ cust.)$$

$$L_{min} = \frac{AS^2}{658} \quad \text{(for S < L)} \quad (metric)$$

$$L_{min} = \frac{AS^2}{2158} \quad \text{(for S < L)} \quad (US\ cust.)$$

Sag Vertical Curve

$$L_{min} = 2S - \left(\frac{120 + .5S}{A}\right) \quad \text{(for S > L)} \quad (metric)$$

$$L_{min} = 2S - \left(\frac{400 + 3.5S}{A}\right) \quad \text{(for S > L)} \quad (US\ cust.)$$

$$L_{min} = \frac{AS^2}{120 \quad .5S} \quad \text{(for S < L)} \quad (metric)$$

$$L_{min} = \frac{AS^2}{400 + 3.5S} \quad \text{(for S < L)} \quad (US\ cust.)$$

SECTIONS LEVEL ACROSS

$$w = \frac{b}{2} + mh$$

Area of cross sectio = $h(b+mh)$

SECTIONS WITH A CROSS FALL

$$w_1 = \left(\frac{b}{2} + mh\right)\left(\frac{k}{k-m}\right)$$

$$w_2 = \left(\frac{b}{2} + mh\right)\left(\frac{k}{k+m}\right)$$

Area of cross section :

$$= \tfrac{1}{2}w_1\left(\frac{b}{2m} + h\right) + \tfrac{1}{2}w_2\left(\frac{b}{2m} + h\right) - \tfrac{1}{2}b\,\frac{b}{2m}$$

$$= \frac{1}{2m}\left\{\left(\frac{b}{2} + mh\right)(w_1 + w_2) - \frac{b^2}{2}\right\}$$