MIDDLE EAST TECHNICAL UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

CE 344 LABORATORY 3: TESTS ON CONCRETE

You should write a report about **only** the determination of unit weight of concrete (ASTM C 138) by using the data given below. In all parts, except 'Discussion of Results' part, you should consider about the determination of unit weight of concrete. In conclusion part, do not forget to specify the type of concrete with respect to its unit weight.

Mass of measure (kg)	Mass of measure filled with concrete (kg)	Volume (L)
6.2	25	8

In "Discussion of Results" part,

1. Assume that you have to design a concrete mix for the following tests with the number of samples used.

Test Name	Related Standard	Number of Samples
Compressive Strength Test	ASTM C 39	3*
Splitting Tensile Strength Test	ASTM C 496	3*
Flexural Tensile Strength Test	ASTM C 78	3**

* The diameter of the specimen is 10 cm, the height of it is 20 cm.

** The length of the specimen is 32.5 cm. The dimensions of the cross section are 7.5 cm x 7.5 cm. Span length is 27.5 cm.

a- Using the unit weight of concrete you have calculated, please specify how many kilograms of concrete you will need for the given samples.

b- For the compressive strength test, the names of 3 samples are given as C1, C2 and C3. Similarly, for the splitting tensile strength tests and flexural tensile strength tests, the names of the samples are given as S1, S2, S3 and F1, F2, F3, respectively. Below, you can see the ultimate loads carried by the specified specimens.

Name of the sample	Ultimate Load (kN)	Name of the specimen	Ultimate Load (kN)	Name of the specimen	Ultimate Load (kN)
C1	234.50	S1	82.50	F1	4.50
C2	248.70	S2	86.00	F2	4.80
C3	269.80	S3	92.70	F3	4.92

Please fill in the gaps highlighted with yellow color (You must show your work for each test).

Name of the specimen	Compressive Strength (MPa)	Name of the specimen	Splitting Tensile Strength (MPa)	Name of the specimen	Flexural Tensile Strength (MPa)
C1		S1		F1	
C2		S2		F2	
C3		S3		F3	
Average		Average		Average	

c- Please by using the strength values you have found in part b, find a linear relation between
   (1) compressive strength and splitting tensile strength and
   (2) compressive strength and flexural tensile strength.

Note: ASTM standards can be downloaded from METU Library web page>e-Resources>Databases>ASTM Standards (IHS Standard Expert)

d- Now, you have a concrete with a compressive strength of 115 MPa.

(1) Using the relations, you have found in part c, please try to estimate splitting and flexural tensile strength of this concrete.

(2) Assume that the actual splitting and flexural tensile strength of this specimen is 7 and 10 MPa, respectively. What is the percent error of your estimations in the previous question? Comment on the performance of your estimations. State your reasoning.

2. Assume that you have two concrete samples. Their properties are shown in the following table.

	Concrete 1	Concrete 2
Cement (kg/m^3)	300	300
Water (kg/m^3)	135	135
Fine Aggregate (kg/m^3)	1100	1100
Coarse Aggregate (kg/m^3)	900	900
Air-entraining admixture	×	✓
Air content (%)	2.2	5.0

NOTE: The types of cement, fine and coarse aggregate are the same for all concretes. The same compacting effort was applied on all concretes.

Answer the following:

I. Compare the workability of fresh states of Concrete 1, 2. Explain your reasoning.

II. Compare the 28-day compressive strength of Concrete 1, 2. Explain your reasoning.

Note: ASTM standards can be downloaded from METU Library web page>e-Resources>Databases>ASTM Standards (IHS Standard Expert)

MIDDLE EAST TECHNICAL UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

CE 344 LABORATORY 3

- For detailed information on these tests, access www.astm.org within METU campus to download these standards.

ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C496 – Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

ASTM C78 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

Note: ASTM standards can be downloaded from METU Library web page>e-Resources>Databases>ASTM Standards (IHS Standard Expert)