CE 344 LABORATORY I: TESTS ON PORTLAND CEMENTS

The tests conducted within the laboratory session are shown below. For detailed information on these tests, access www.astm.org within METU campus to download them.

ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

ASTM C150 Standard Specification for Portland Cement

ASTM C187 Standard Test Method for Amount of Water Required for Normal Consistency of Hydraulic Cement Paste

ASTM C188 Standard Test Method for Density of Hydraulic Cement

ASTM C191 Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle

ASTM C204 Standard Test Methods for Fineness of Hydraulic Cement by Air-Permeability Apparatus

ASTM C305 Standard Practise for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

ASTM C348 Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

ASTM C1437 Standard Test Method for Flow of Hydraulic Cement Mortar

Note: ASTM standards can be downloaded from METU Library web page>e-resources>Databases>ASTM Standards and Engineering Digital Library

In objective, preliminary remarks, test specimen, apparatus, test procedure, calculations, results and conclusion sections,

The test stated on **Determination of Fineness of Hydraulic Cement by Air – Permeability Apparatus** (ASTM C 204-18 (Method A)) should be based.

Assume that it is required to compare the fineness of the cements, the properties of which are given in the following table. The bulk volume of the bed of cement was determined 1.76 cm^3.

	Cement A	Cement B	Cement C
Measured Time Interval – T (s)	121	60	98
Density – ρ (g/cm^3)	3.16	3.12	3.17
Porosity – ε	0.52	0.49	0.51
b	0.9	0.9	0.9

It can be assumed that the temperature variations are ignored and the constants used in the equations are given in the following table.

Constants	
S_s	3420 cm^2/g
T_s	78 s
η_s	18.32 µPa.s
ρ_s	3.15 g/cm^3
b_s	0.9
ε_s	0.5

Calculate the fineness results according to Eqn. 9 in the relevant standard and compare the results of the cements. Do not forget to specify the mass required for each cement.

In discussion of results section,

In order to determine the flexural strength at 28 days of 3 cement mortars (Mortar X, Mortar Y and Mortar Z), for each mortar, 3 prismatic samples (4 x 4 x 16 cm^3) have been prepared.

The only difference between them is the water amount used. The fracture loads for the mortars are given in Table 1.

Table 1. Fracture Loads at 28 days

Mortars / No	Mortar X [N]	Mortar Y [N]	Mortar Z [N]
1	1065	1252	951
2	1095	1221	1002
3	1078	1275	1012
Flexural Strength (MPa)			

- Calculate the flexural strength of the mortars separately according to ASTM C 348 – 18 and fill the cells highlighted in yellow.
- Assuming all other factors are same and considering the test results, compare the water content of the mortars and try to estimate their flow percent, reasonably. Explain your reasoning.