

**QUESTION 1**

A sample of moist aggregate with a volume of  $200 \text{ cm}^3$  and a mass of 240 g was dried to saturated surface dry (SSD) condition. After drying, the mass and the volume of this sample were 230.8 g and  $143 \text{ cm}^3$ , respectively.

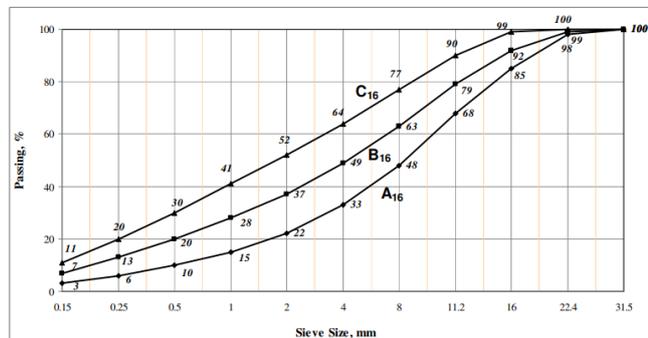
- a) Calculate the moisture content of the aggregate (H%).
- b) Calculate bulk density (unit weight) of the moist and the SSD aggregates.
- c) Determine the amount of the moist aggregates required both in mass and volume to obtain  $1 \text{ m}^3$  of SSD aggregate.
- d) Calculate mass of excess water in this amount of the moist aggregate.

## QUESTION 2

The sieve analysis was performed on three groups of dry aggregates and the results are given below. According to the test results:

- Calculate the percentage passing (P%) of each aggregates.
- Find the appropriate mix ratio of each aggregate considering the limit values of the reference curves.
- Plot the grading curve of each aggregate and also the mix aggregate (4 curves in total) on the same graph.
- Calculate the fineness modulus of the mix aggregate.

Sieve Size $d_i$ (mm)	AGGREGATE 1: Natural Sand 1000 g			AGGREGATE 2: Crushed Stone No.1 3000 g			AGGREGATE 3: Crushed Stone No.2 3000 g			MIX AGGREGATE		D <sub>max</sub> =16 mm		
	Mass Retained (g)	Mass Passing (g)	Passing P <sub>1</sub> %	Mass Retained (g)	Mass Passing (g)	Passing P <sub>2</sub> %	Mass Retained (g)	Mass Passing (g)	Passing P <sub>3</sub> %	Passing P <sub>m</sub> %	100-P <sub>m</sub> %	A <sub>16</sub>	B <sub>16</sub>	C <sub>16</sub>
31.5	0			0			0					100	100	100
22.4	0			0			0					98	99	100
16	0			240			220					85	92	99
11.2	0			193			1510					68	79	90
8	0			796			785					48	63	77
4	0			982			485					33	49	64
2	236			534			0					22	37	52
1	229			184			0					15	28	41
0.5	130			71			0					10	20	30
0.25	140			0			0					6	13	20
0.15	145			0			0					3	7	11
Ratio in the mix	.....%			.....%			.....%			Σ =	....			



### **QUESTION 3**

An aggregate batch of 1.40 tons of mass and 1 m<sup>3</sup> volume was obtained from an aggregate production facility. It was determined that the oven-dry mass of this aggregate batch was 1.34 tons. In addition, a water absorption test was performed and after the test, the mass of the saturated and surface dry aggregate batch was determined to be 1.36 tons. Determine the moisture content and water absorption values of the aggregate batch. Calculate the amount of excess water on the surface of 950 kg of aggregates taken from this stock.

## QUESTION 4

The sieve analysis was performed on three groups of dry aggregates and the results are given below. According to the test results:

- Calculate the percentage passing (P%) of each aggregate.
- Find the appropriate mix ratio of each aggregate provided that the 45% of the aggregate in the mixture is coarser than 8 mm and 20% of the aggregate in the mixture is finer than 0.5 mm.
- Check the conformity of the mixing values to the limit values of the reference curves.
- Plot the grading curve of each aggregate and also the mix aggregate (4 curves in total) on the same graph.
- Calculate the fineness modulus of the mix aggregate, and interpret the fineness modulus value obtained. Does the fineness modulus give any idea about the gradation of the mixture aggregate?

Elek açıklığı $d_i$ (mm)	AGREGA NO. 1 (Doğal Kum) : ... g			AGREGA NO. 2 (Kırmataş #1) ... g			AGREGA NO. 3 (Kırmataş #2) ... g			KARIŞIM AGREGASI		$D_{max}=16$ mm		
	Kalan (g)	Geçen (g)	Geçen % $P_1$	Kalan (g)	Geçen (g)	Geçen % $P_2$	Kalan (g)	Geçen (g)	Geçen % $P_3$	Geçen % $P_d$	100- % $P_k$	$A_{16}$	$B_{16}$	$C_{16}$
31,5	0			0			0					100	100	100
22,4	0			0			0					98	99	100
16,0	0			90			420					85	92	99
11,2	0			270			1380					68	79	90
8	0			870			660					48	63	77
4	0			840			540					33	49	64
2	140			480			0					22	37	52
1	90			240			0					15	28	41
0,5	250			210			0					10	20	30
0,25	190			0			0					6	13	20
0,15	190			0			0					3	7	11
Ratio in the mix										$\Sigma$				