

CONSTRUCTION MATERIALS - ENCE234

Assignment # 1 – 20 points

Q1. When you do a structural design, which failure mode should be applied?

Q2. Discuss why is concrete so popular?

Q3. Compared with other structural materials such as steel, discuss why concrete quality varies considerably.

Q4. Given the following cement composition table, complete the table below

Chemical Compositions and Physical Properties	Portland Cement Type				
	C1	C2	C3	C4	C5
C ₃ S	40	25	50	45	60
C ₂ S	40	50	25	30	15
C ₃ A	4	5	12	7	10
C ₄ AF	10	12	8	12	8
CSH ₂	4	4	5	5	5
Fineness (Blaine, m ² /kg)	350	300	350	350	450
Compressive strength (1 day, MPa [psi])	6 [900]	3 [450]	7 [1000]	6 [900]	14 [2000]
Heat of hydration (7 days, J/g)	250	210	330	250	500

No.	ASTM Type	Explanation. why you select this ASTM type?
C1		
C2		
C3		
C4		
C5		

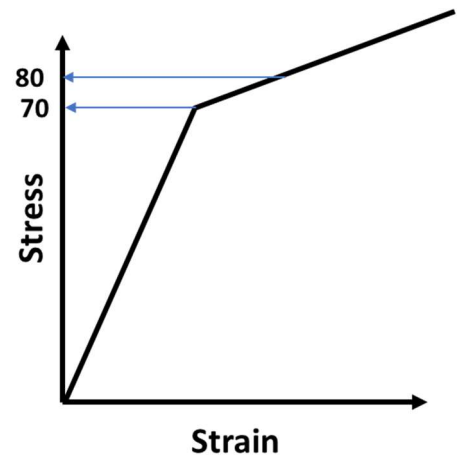
Q5. A mixture of 1800 g of gravel with an effective absorption of 1.3% and 1200 g of sand with surface moisture of 2.51% was added into a concrete mix. Compute the adjustment of water that must be made to maintain a constant w/c ratio.

Q6. A 1000g sample of coarse aggregate in the SSD condition in air weighed 633g when immersed in water.

A. Calculate the BSG of the aggregate.

B. If some sample from the same batch of aggregate after being exposed to air dry condition for some time weighed 978 g in air and weighed 630 g after they immersed in water for 10 hours, calculate the moisture content, MC(SSD), of the air-dried aggregate at that time.

Q7. An elastoplastic material with strain hardening has the stress-strain relation shown in the Figure. The modulus of elasticity is 25×10^6 psi, yield strength is 70 ksi, and the slope of the strain-hardening portion of the stress-strain diagram is 3×10^6 psi.



- Calculate the strain that corresponds to a stress of 80 ksi.
- If the 80-ksi stress is removed, calculate the permanent strain.

Q8. A sieve analysis test was performed on a sample of fine aggregate and produced the following results:

Sieve, mm	4.75	2.36	2.00	1.18	0.60	0.30	0.15	0.075	pan
Amount retained, g	0	33.2	56.9	83.1	151.4	40.4	72.0	58.3	15.6

- Calculate the percent passing each sieve, and show if the sample satisfies the ASTM requirement of concrete fine aggregates.
- Determine the fineness modulus of the sample.

Q9. What type of cement would you use in each of the following cases? Why?

- Construction of a large pier (عمود ضخمة لجسر معلق مثلاً)
- Construction in Ramallah in winter where the temperature is expected to remain under 5°C for a long time.
- Construction in Jericho in summer (expected temp. above 30°C)
- Concrete structure without any specific exposure condition
- Building's foundation in soil with severe sulfate exposure.

Q10. Three standard mortar cubes were made using nonpotable water available at the job site, and three others were made using potable water. The cubes were tested for compressive strength after seven days of curing and produced the following failure loads in kg:

Nonpotable Water	Potable Water
6909	7773
6591	7400
7227	7364

Based on these results only, would you accept that water for mixing concrete according to ASTM standards? Explain why.