

End Semester Examination, December-2016 Civil Engineering Materials (CVL3211)

Semester: 5th
Full mark: 60

Branch: Civil Engineering
Time: 3 Hours

All questions carry equal marks. All bits of each question carry equal marks.

Subject Learning Outcome (Student will able to)	*Taxonomy Level	Question number	Marks
Interpret a material based on its stress-strain behavior and calculate various physical quantities related to stress-strain behavior.	L3	1(a), 1(b), 1(c)	10
	L2	5(a), 5(b)	
Illustrate the behavior of cement based on its raw material and chemical composition.	L1	3(a)	8
	L2	3(c), 4(c)	
	L4	3(b)	
Show the effects of different admixtures on properties of cement concrete and compute composition of a concrete mix.	L2	4(a), 4(b)	10
	L4	2(a), 2(b), 2(c)	
Demonstrate concepts about bitumen and aggregate mixes.	L2	10(a), 10(b)	10
	L4	6(a), 6(b), 6(c)	
Classify different types of bricks and describe the manufacturing process of brick.	L2	8(a), 8(b), 8(c)	8
	L1	9(c)	
Choose replacement of steel with non-ferrous materials in concrete and relate about the contemporary usage of reinforcing materials.	L2	9(a), 9(b), 10(c)	14
	L5	7(a), 7(b), 7(c), 5(c)	

*Blooms taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all ten questions.

Question 1		
a.	Compute modulus of resilience of a material shown in Figure 1 given on last page.	2
b.	Compute Yield stress based on offset method for Figure 1.	2
c.	Assuming Yield stress is equal to rupture stress in Figure 1, Compute toughness.	2
Question 2		
a.	$0.25m^3$ of M25 concrete with water cement ratio of 0.5 and air content 3% is to be formed, given specific gravities of cement sand and aggregates are 3, 2.6, 2.7. Calculate volume of solids and air in mix.	2
b.	Solve the volume balance equation and find weight of cement required.	2
c.	Calculate the weight of sand (fine aggregates) and coarse aggregates required.	2
Question 3		
a.	Name the chemicals that are responsible for initial setting and false setting of cement respectively?	2
b.	Analyze and select which will have greater workability, ordinary Portland cement or fly ash cement?	2
c.	Show a graph for water cement ratio and strength of cement. Show and Describe this behavior in graph at water cement ratio lower than standard consistency?	2
Question 4		
a.	Two concretes A and B with proportions M20 and M30 are given. Describe which will require more curing?	2
b.	Describe what will happen if size of aggregates is increased keeping their proportion constant?	2
c.	Cement A passes 6% and Cement B passes 15% from $IS90\mu$ sieve. Identify which of two will have faster rate of hydration? Explain.	2
Question 5		
a.	Give two examples of elastic and viscoelastic materials each.	2
b.	Explain endurance limit. Sketch a typical graph of number of load cycles versus σ_a/σ_y .	2
c.	Select necking and rupture (failure) point on a typical $\sigma - \epsilon$ curve for steel.	2
Question 6		
a.	Given two asphalts A_1 and A_2 having penetration grades 70-80 and 40-50 respectively. Identify which will have higher viscosity?	2
b.	Classify for above data, out of A_1 and A_2 which can be used as a better sealant? Explain?	2

c.	To form an asphalt aggregate mix, 1 Kg asphalt is mixed with 1 Kg of aggregates. If air content and absorbed aggregates content are equal and one fifth of total asphalt, Calculate weight of unabsorbed asphalt binder.	2
Question 7		
a.	Given %C of two steels S_1 and S_2 are 1.5 and 1 respectively. Compare and sketch their relative $\sigma - \epsilon$ curve.	2
b.	For above data, out of S_1 and S_2 , predict which will require more heat to reach pure Austenite line.	2
c.	For above data, If S_1 is alloyed with 15% Nickel and S_2 is alloyed with 5% Chromium. Evaluate and compare weldability of S_1 and S_2 .	2
Question 8		
a.	Describe the advantages of fly ash bricks over clay bricks?	2
b.	Report four differences between kiln and clamp burning of bricks.	2
c.	Explain how brick soundness and water absorption are related?	2
Question 9		
a.	Describe hardening/quenching of steel.	2
b.	Explain why tempering is followed just after hardening of steel?	2
c.	State the uses of frog in brick?	2
Question 10		
a.	Summarize the difference between asphalt emulsion and asphalt concrete?	2
b.	Describe major differences between asphalt coat and seal.	2
c.	Give one example how are FRC being used as construction material?	2

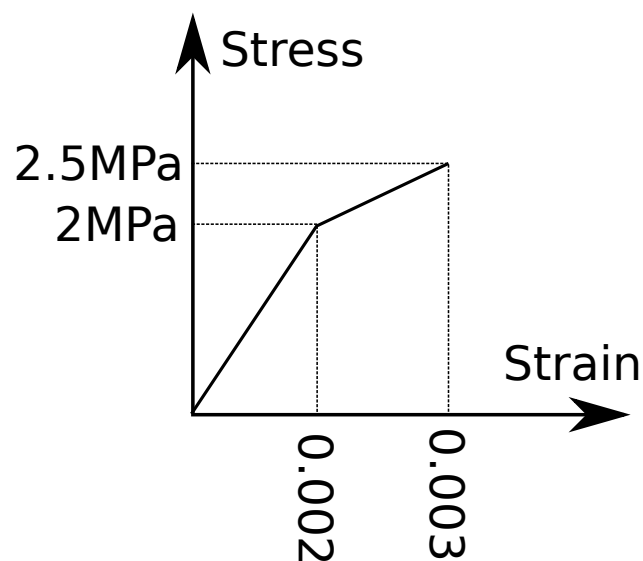


Figure 1: $\sigma - \epsilon$ plot for question 1

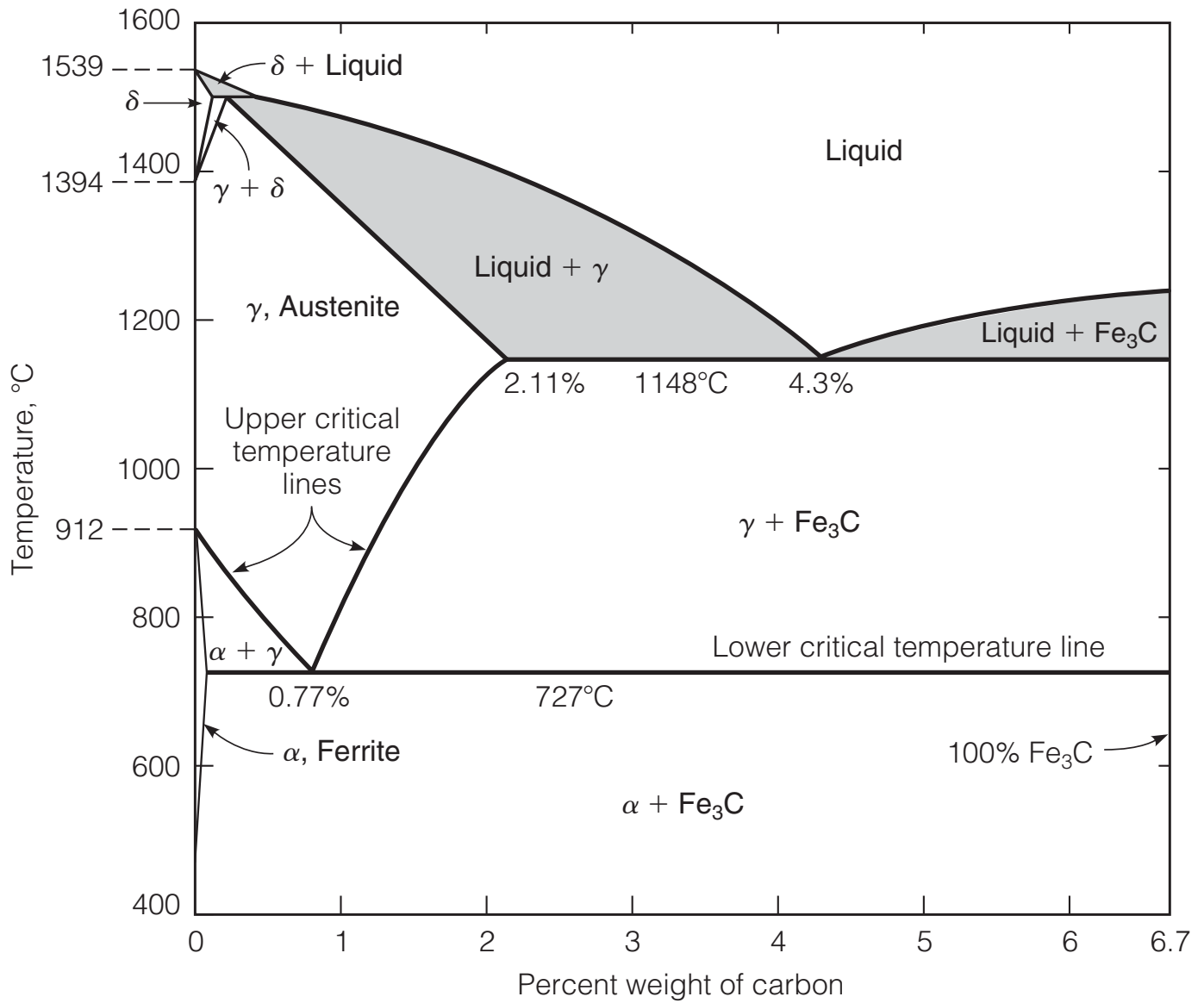


Figure 2: Iron-Carbon phase diagram