

10. The risk of segregation is more for
a. Wetter mix
b. Larger proportion of maximum size aggregate
c. Coarser grading
d. All of the above
11. Kiln running with a slow rpm will result in
a. Big size clinker ball formation
b. Heavy coating formation in kiln
c. Kiln inlet jamming
d. Both a and b
12. In the cement manufacturing process, the small bellite crystals begin to form at temperature ranges of
a. 700 - 900 °C b. 1150 - 1200 °C c. 1200 - 1350 °C d. 1350 - 1450 °C
13. Which one of the following cement components is the most soluble in water?
a. C₃A b. C₂S c. C₃S d. C₄AF
14. Which one of the following cement phases has the highest reactivity with water?
a. Aluminate b. Alite c. Ferrite d. Belite
15. Which of the following compounds is responsible for Portland cement's early strength gain?
a. C₃A b. C₂S c. C₃S d. C₄AF
16. Which is the dormant stage during hydration of Portland cement?
a. I b. II c. III d. IV
17. Which of the following is not a major concern for the cement industry?
a. Water discharge b. Solid waste c. Noise d. Air pollution
18. Which of the following dust abatement techniques are most commonly used in cement manufacturing plants?
a. Bag filters b. Electrostatic precipitators
c. Cyclones d. Gravel bed filters
19. An intergrind should not have less than what percentage of the 28 day strength of the control cement mortar?
a. 55 % b. 65 % c. 75 % d. 85%
20. Which of the following requires continuous monitoring in a cement plant?
a. Free lime content monitoring b. CO₂ - SO₃ monitoring
c. Particle size monitoring d. Ignition loss monitoring

KATHMANDU UNIVERSITY
End Semester Examination
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Level : B.E.
Year : III
Time : 2 hrs. 30 mins.

Course : CHEG 323
Semester : II
F. M. : 40

SECTION "B"

[4Q × 10 = 40 marks]

Attempt *ALL* questions.

1. The following data are available for a cement industry.
Kiln Capacity: 3000 tonnes/ day

Preheater exit gas details:
Volume (m_{PH}): $1.5 \text{ Nm}^3 / \text{kg clinker}$
Specific heat capacity ($C_{P PH}$): $0.36 \text{ kcal/ kg/ } ^\circ\text{C}$
Temperature (T_{PHI}): $316 \text{ } ^\circ\text{C}$

Limestone moisture content LM: 2 %
Raw mill running hrs: 22 hrs/ day
Raw meal to clinker factor: 1.55
Specific heat consumption: 700 kcal/ kg clinker
Raw coal moisture: 15 %
Heat requirement for moisture in raw mill & coal mill: 950 kcal/ kg water
Calorific value of fine coal used: 5000 kcal/ kg coal

From the given data, calculate

- Heat available in the preheater gas. [1]
 - Heat requirement for the raw mill. [4]
 - Specific coal consumption per kg of clinker. [1]
 - Moisture evaporation in the coal mill. [2]
 - Heat requirement for the coal mill. [2]
2. For a cement manufacturing plant
- Describe the preparation process for the raw meal that is fed to the kiln with relevant process diagrams (Process before calcination). [4]
 - Describe the calcination process with relevant chemical reactions and process diagrams. [6]
3. Write about the different types of pollution problems encountered in the cement industry and their abatement techniques. [10]

OR

Briefly discuss the methods of testing in cement industry for quality control, maintenance and pollution control.

4. Describe the hydration process of Portland cement with relevant graphs and reactions. [10]

OR

Describe the typical process problems in a cement plant with the relevant causes for the said problems.

