1 Exam Prep

Design and Control of Concrete Mixtures Questions

Problem Set #1

1. The recommended maximum slump used for concrete pavement is __________.
   A. 1”       B. 3”       C. 4”       D. 6”

2. A contactor has poured a 5” thick concrete slab. The concrete has ¾’ minus aggregate size. The slab is 50’ long by 20’ wide. The specification for the job state that the contractor must provide saw cuts for expansion and contraction of the slab in accordance with Design and Control of Concrete, how many lineal feet of saw cut would the contactor have to make?
   A. 130’       B. 150’       C. 115’       D. 140’

3. The Building Code requirements for reinforced concrete (ACI-318) requires at least __________ strength tests for a 5,000 sq. ft. slab and ________ cylinders for each test.
   A. 1-2       B. 1-1       C. 2-2       D. 2-4

4. The type of Portland cement that is most commonly used in construction and generally considered a general purpose cement is __________.
   A. Type I       B. Type II       C. Type IIIA       D. Type V

5. According to the CRSI, the normal diameter of a #11 bar is __________.
   A. 1.56”       B. 1.1”       C. 1.41”       D. 1.0”

6. According to Design and control of Concrete Mixes, the normal slump for group I, low density weight concrete is normally the range of __________.
   A. 4       B. 6       C. 10       D. 12

7. The network of fine cracks found on the surface of concrete and caused by minor surface shrinkage are known as __________.
   A. shrinkage cracks       B. dry cracks       C. crazing cracks       D. plastic shrinkage cracks

8. A contractor is bidding a job and receives a quote for saw cutting a slab on grade in accordance with Design and control of Concrete Mixes in the amount of $2.00/lf. The dimensions of the slab are 30’ x 60’ x 5” thickness and the slab consists 4’ slump concrete with a ¾” + aggregate. The amount to be added to his bid is __________.
   A. $ 300.00       B. $ 240.00       C. $ 480.00       D. $ 1,080.00
9. Cutting or drilling of truss members in the field must be approved by __________.
   A. contractor   B. owner   C. engineer   D. architect

10. A contractor has to pour a 9,000 sf slab. According to ACI 318, he must take __________.
    A. 1 test w/ 2 cylinders   B. 2 test w/ 2 cylinders
    C. 1 test w/ 4 cylinders   D. 3 test w/ 6 cylinders

11. The purpose of tining a concrete roadway slab is to __________.
    A. improve traction   B. control cracking
    C. limit hydroplaning   D. both A and C

12. According to Design and Control of concrete Mixes, the normal slump for group I, low density light weight concrete is normally in the range of __________.
    A. 4   B. 6   C. 10   D. 12

13. What percentage of concrete by volume is made up of coarse and fine aggregate?
    A. 30% to 45%   B. 45% to 60%   C. 60% to 75%   D. 75% to 90%

14. The network of fine cracks found on the surface of concrete and caused by minor surface shrinkage are known as __________.
    A. shrinkage cracks   B. dry cracks
    C. crazing cracks   D. plastic shrinkage cracks

15. For a 6 inch concrete slab 20’ x 50’, with ¾”+ aggregate, how many construction joints should there be if the concrete has a slump less than 4 inches?
    A. 2   B. 3   C. 4   D. 5

16. The Building Code requirements for reinforced concrete (ACI-318) requires at least __________ strength tests for a 6,000 sq. ft. slab and ________ cylinders for each test.
    A. 1-2   B. 1-1   C. 2-2   D. 2-4

17. The unit weight of cement is __________.
    A. 150 lbs/cf   B. 40 lbs/cf   C. 94 lbs/cf   D. 104 lbs/cf

18. One of the principal causes of surface in concrete slabs is __________.
    A. shrinkage cracking due to improper consolidation
    B. improper curing
    C. rain damage
    D. finishing while bled water is on surface
19. The standard weight of concrete for a combination of conventional concrete and reinforcing steel is commonly assumed to be ______ lbs/cf.

A. 137  B. 150  C. 4,050  D. 165

20. Hydration can best be defined as ________.

A. accelerating the curing of concrete  
B. to move and consolidate the concrete  
C. consolidation only of the concrete  
D. only for the movement of concrete within the forms

21. The type of joint used to provide movement in the plane of a slab and induce controlled cracking caused by drying and thermal shrinkage is known as a ________joint.

A. isolation  B. construction  C. contraction  D. slip

22. A contractor is bidding a building job. The specifications for the project states that the contractor must saw cut the grade slab of the building in accordance with Design and control of Concrete Mixes. If the concrete slab is 6” thick with a ¾” + aggregate, poured at 3” slump, the total footage of saw cuts will be ________.

A. $ 300.00  B. $ 240.00  C. $ 480.00  D. $ 1,080.00

23. What is the measure of the consistency of concrete?

A. slump  B. water/cement ratio  C. air entrainment  D. mix

24. Typically highway pavements are textured by ________ the surface of the slab.

A. brooming  B. tining  C. troweling  D. floating

25. The purpose of using a vibrator during the concrete placement is for:

A. accelerating the curing of concrete  
B. to move and consolidate the concrete  
C. consolidation only of the concrete  
D. only the movement of concrete within the forms

26. The maximum amount of salt water that may be used in a concrete mix for non-reinforced concrete elements is:

A. 100%  B. 0%  C. 25%  D. 60%
Problem Set #2

1. The suggested spacing of control joints in floors on ground with aggregate larger than 3/4” and a slab thickness of 8” is ____________.
   A. 14 feet  
   B. 16 feet  
   C. 18 feet  
   D. 20 feet

2. For structural concrete (such as slabs, beams and small footings), the length of the curing period for ambient temperatures above 40°F is a minimum of 7 days or the time necessary to attain ____________ of the specified compressive or flexural strength.
   A. 50%  
   B. 60%  
   C. 70%  
   D. 80%

3. When conveying concrete by use of chutes over ____________, the concrete must discharge into a hopper before distribution to the point of need.
   A. 10 feet long  
   B. 15 feet long  
   C. 20 feet long  
   D. 25 feet long

4. For structural concrete such as beams, slabs and small footings the length of the curing period for ambient temperatures above ____________ is a minimum of 7 days or the time necessary to attain 70 % of the specified compressive or flexural strength.
   A. 32°  
   B. 35°  
   C. 37°  
   D. 40°

5. Given: A trail batch of non-air-entrained concrete with a 3 to 4 inch slump and a maximum aggregate size of 1 1/2” is mixed. The maximum approximate mixing water requirement is ____________ pounds per cubic yard. Select the closest answer.
   A. 250  
   B. 275  
   C. 300  
   D. 315

6. Aggregates make up about ____________ percent of the concrete components.
   A. 30 to 45  
   B. 45 to 60  
   C. 60 to 75  
   D. 75 to 90

7. At three days after pouring, ASTM Type III cement has ____________ of the compressive strength of ASTM Type 1 cement at 7 days.
   A. 52%  
   B. 64%  
   C. 100%  
   D. 125%
8. Because of cements low specific heat, a cement temperature change of 10°F generally will change the concrete temperature by ________________.

A. 1° B. 10°F C. 15°F D. 20°F

9. In hot weather concreting, when the rate of evaporation exceeds ________________, precautionary measures are almost mandatory to prevent plastic cracking.

A. 0.1 pound per square foot per minute
B. 0.1 pound per square foot per hour
C. 0.2 pound per square foot per minute
D. 0.2 pound per square foot per hour

10. The addition of a retarding admixture to a stationary mixer should be completed within ______minute(s) after all water has been added to the cement or prior to the start of the last 3/4 of the mixing cycle.

A. 1 minute
B. 1 1/2 minute
C. 2 minutes
D. 2 1/2 minutes

11. Specifications generally require that cement in individual batches be measured within ______ percent of accuracy in order to produce concrete of uniform quality.

A. 1% B. 1 1/2% C. 2% D. 2 1/2%

12. Aggregates which are dry at the particle surface but contain some interior moisture, and thus are somewhat absorbent are designated as ________________.

A. ovendry
B. air dry
C. saturated surface dry
D. damp or wet

13. Specifications generally require that water in individual batches be measured within ______ or accuracy in order to produce concrete of uniform quality.

A. 1% B. 1 1/2% C. 2% D. 2 1/2%

14. A material most commonly used as an admixture to accelerate setting and early strength development of concrete is ________________.

A. Lignin
B. Calcium Chloride
C. Borax
D. Natural Pozzolans
15. Strength tests for each class of concrete placed each day should be taken not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each __________ or surface area of slabs or walls.

A. 500 square feet  
B. 1,000 square feet  
C. 2,000 square feet  
D. 5,000 square feet

16. Where tests are required, fresh concrete should be sampled in accordance with ASTM C-172. The sample should be a minimum of __________ and must be used within 15 minutes of the time it is removed from the batch.

A. 0.5 cubic foot  
B. 1.0 cubic foot  
C. 1.5 cubic foot  
D. 2.0 cubic foot

17. The curing period of concrete can be reduced during cold weather by using high—early strength concrete which speeds setting time and strength development. However, a minimum temperature of __________ must be maintained in the concrete for a full three days.

A. 35°F  
B. 47°F  
C. 50°F  
D. 55°F

18. Given: Concrete is to be placed with a slump of 3 inches and a maximum aggregate size of 1 1/2 inches. The maximum water content at 95°F is determined through trail mix procedures. If the concrete is to be placed at 50°F, the maximum water content should __________.

A. remain the same  
B. be reduced by approximately 10.0% from that specified  
C. be reduced by approximately 11.1% from that specified  
D. be increased by approximately 10.0% over that specified

19. Given: A trail batch of air-entrained concrete with a 1 to 2 inch slump and a maximum aggregate size of 1 1/2" is mixed. The maximum approximate mixing water requirement is __________ pounds per cubic yard. Select the closed answer.

A. 250  
B. 275  
C. 300  
D. 315

20. When conveying concrete by the use of chutes, the chutes must slope a minimum of 1 vertical to __________ horizontal.

A. 3.0  
B. 3.5  
C. 4.0  
D. 4.5
21. The recommended type of cement to be used in concrete which will be in contact with sulfate waters containing 50 PPM of SO4 is.

A. ASTM Type I  
B. ASTM Type II  
C. ASTM Type III  
D. ASTM Type IV

22. Given: A trail batch of non-air-entrained concrete with a 1 to 2 inch slump and a maximum aggregate size of 3/4" is mixed. The maximum approximate mixing water requirement is _________ pounds per cubic yard. Select the closest answer.

A. 275  
B. 280  
C. 305  
D. 315

23. Specifications for ready mixed concrete (ASTM C-94) require that the discharge of concrete be completed within hours or before the drum has revolved 300 times, whichever occurs first.

A. 1 1/2  
B. 2  
C. 2%  
D. 3

24. The curing period of concrete can be reduced during cold weather by using high-early strength concrete which speeds setting time and strength development. If the minimum temperature in the concrete is maintained at 50°F during the curing period, the period can be reduced to ____________ day(s).

A. one  
B. two  
C. three  
D. four

25. At three days after pouring, ASTM Type I cement has of the compressive strength of ASTM Type II cement at 7 days.

A. 50%  
B. 72%  
C. 80%  
D. 89%

26. The recommended maximum slump for beams and reinforced walls, which are consolidated by a vibrator, is ____________ inch(es).

A. 1  
B. 2  
C. 3  
D. 49

27. Concrete which is kept agitated can be placed and compacted within a maximum of ________ after the cement and water are mixed.

A. 30 minutes  
B. 45 minutes  
C. 1 hour  
D. 1 1/2 hours

28. Studies indicate that the air content of concrete decreases when the:

A. Compressive strength decreases  
B. Abrasion resistance decreases  
C. Air-void-spacing factor increases  
D. Cement content increases
29. Specifications usually require a minimum of 1 minute for jobsite stationary mixers of up to one-cubic yard with an increase of ____________ for each additional cubic yard, or fraction thereof, of capacity.

A. 15 seconds  
B. 30 seconds  
C. 45 seconds  
D. 1 minute

30. A material most commonly used as an admixture to improve durability of concrete is ________________.

A. Calcium Chloride  
B. Borax  
C. Natural Pozzolans  
D. Alkylbenzene Sulfonate

31. For structural concrete such as columns, slabs, piers, etc. the length of the curing period for ambient temperatures above 40°F is a minimum of ____________ or the time necessary to attain 70% of the specified compressive or flexural strength.

A. 3 days  
B. 7 days  
C. 14 days  
D. 21 days

32. The suggested spacing of control joints in floors on ground with aggregate less than 3/4" and a slab thickness of 8" is ________________.

A. 14 feet  
B. 16 feet  
C. 18 feet  
D. 20 feet

33. At 7 days after pouring, ASTM Type II cement has of the compressive strength of ASTM Type I cement at 7 days.

A. 43%  
B. 54%  
C. 64%  
D. 89%

34. For most concretes, a maximum of ____________ seconds of vibration will provide the desired consolidation.

A. 10  
B. 15  
C. 20  
D. 25

35. Using the ASTM C-360, ball penetration in fresh Portland cement concrete test, a sample of fresh concrete placed in an open container must have a minimum lateral dimension of about 18 inches and the depth must be a minimum of at least ____________ inches.

A. 6 1/2"  
B. 7"  
C. 7 1/2"  
D. 8"
36. Given: It is desired to mix a trail batch of air-entrained concrete with a 3 to 4 inch slump and a maximum aggregate size of 1 inch. The maximum approximate mixing water requirement is _________ pounds per cubic yard. Select the closest answer.

A. 325  
B. 300  
C. 295  
D. 280

37. The amount of Calcium Chloride added to accelerate strength development should not exceed a maximum of by weight of cement.

A. 1.0%  
B. 1.5%  
C. 2.0%  
D. 2.5%

38. The recommended maximum slump for building columns, which are consolidated by a vibrator is ________________ .

A. 1 inch  
B. 2 inches  
C. 3 inches  
D. 4 inches

39. The unit weight of Portland cement is ____________ pounds per cubic foot.

A. 62  
B. 70  
C. 80  
D. 94

40. ________________ concrete is "Ready Mixed" concrete that is manufactured by mixing partially in a stationary mixer then completed in a truck mixer.

A. Shrink Mixed  
B. Truck Mixed  
C. Central Mixed  
D. Mobile Mixed

41. An admixture that is sometimes added to retard the setting time of concrete is ____________ .

A. Lignin  
B. Calcium Chloride  
C. Fly Ash  
D. Stearate of Calcium

42. The recommended maximum slump for reinforced foundation walls which are consolidated by a vibrator is ____________ .

A. 1 inch  
B. 2 inches  
C. 3 inches  
D. 4 inches
43. An admixture that is sometimes added to improve the pump ability of concrete is _____________.

A. Pozzolans  
B. Calcium Chloride  
C. Fly Ash  
D. Stearate of Calcium

44. An admixture that is sometimes added to decrease the permeability of concrete is _____________.

A. Stearate of Calcium  
B. Tributyl Phosphate  
C. Lignin  
D. Borax

45. Given: A trail batch of air-entrained concrete with a 6 to 7 inch slump and a maximum aggregate size of 3/4” is mixed. The maximum approximate mixing water requirement is ____________ pounds per cubic yard. Select the closest answer.

A. 305  
B. 310  
C. 325  
D. 340

46. When testing a specimen of hardened concrete for strength, it is important to check the moisture content of the specimen. A saturated test cylinder will show __________ strength than that of a companion cylinder tested dry.

A. 35% to 45% more  
B. 35% to 45% lower  
C. 20% to 30% more  
D. 20% to 30% lower

47. Given: A trail batch of non-air-entrained concrete with a 3 to 4 inch slump and a maximum aggregate size of 1/2 is mixed. The maximum approximate mixing water requirement is ___________. Select the closest answer.

A. 275 pounds per cubic yard  
B. 280 pounds per cubic yard  
C. 335 pounds per cubic yard  
D. 365 pounds per cubic yard

48. Shallow patches for concrete holes or defects can be filled with a stiff mortar similar to that used in the concrete and should be placed in layers not more than __________ (maximum) in thickness, with each layer given a scratch finish to improve bond with the subsequent layer.

A. 1/8"  
B. 1/4"  
C. 3/8"  
D. 1/2"
49. Where tests are required, fresh concrete should be sampled in accordance with ASTM C-172. The sample should be a minimum of one cubic foot and must be used within _______ of the time it is removed from the batch.

A. 15 minutes
B. 20 minutes
C. 30 minutes
D. 45 minutes
# Answer Key for Design and Control of Concrete:

## Problem Set #1:

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