University of Mumbai

Civil Engineering Examination

Sub: CE-DLO 5062/ Advanced Concrete Technology Year/Sem:- TE/ V Sem
Max. Marks: 80 Duration: - 2Hrs

Q1. Attempt all the MCQS (20 X 2 mark= 40 marks)

1. As the hydration proceeds the deposit of hydrated products on the original cement grains makes the diffusion of water to unhydrated nucleus ---------
   a) Easy
   b) Very Easy
   c) Average
   d) Very Difficult

2. In order to prevent rapid reaction which of the following is added to clinkers
   a) C_4AF
   b) Gypsum
   c) Nitrate
   d) Extra Cement

3. Which of the following doesn't fall under Calcareous Rocks?
   a) Limestone
   b) Cement Rock
   c) Chalk
   d) Marine Shell Deposit

4. To obtain cement dry powder, limestone & shales or their slurry is bunt in rotary kiln at temperature between
   a) 1100 – 1200 ^{0}C
   b) 1200 – 1300 ^{0}C
   c) 1300 – 1400 ^{0}C
   d) 1400 – 1500 ^{0}C

5. Moisture content in slurry for wet process is
   a) 35-50 %
   b) 12 %
   c) 40-45 %
   d) 100 %

6. Durability of concrete is proportional to
   a) Sand Content
   b) Water Cement ratio
   c) Aggregate ratio
   d) Cement Aggregate ratio

7. The cement concrete from which entrained air & excess water are removed after placing in position is called as
   a) LWC

b) Prestressed Concrete
c) Sawdust Concrete
d) Vacuum Concrete

8. Density of no fines concrete with light weight aggregate is
   a) 1600 - 1900 kg/m^3
   b) < 300 kg/m^3
   c) > 300 kg/m^3
   d) > 2500 kg/m^3

9. Diameter of round steel fibres lies in range of
   a) 0.3-0.5 mm
   b) 0.25-0.75 mm
   c) 0.155-0.41 mm
   d) 0.25-0.90 mm

10. Main component in sulphur infiltrated concrete is
   a) Cement
   b) Sulphur
   c) Aggregates
   d) Sulphur & Aggregates

11. Bending strength of sulphur infiltrated concrete in MPa is
   a) 60-115
   b) 10-16
   c) 35-50
   d) 500

12. IS code for specification for Ordinary Portland Cement Grade 33 is
   a) IS 269:1989
   b) IS 383:1979
   c) IS 455:1989
   d) IS 456:2000

13. Which of the following can’t be reason for shrinkage of concrete
   a) W/C ratio
   b) Temperature
   c) Cement Content
   d) Formwork

14. Which of the following test requires leak proofing of casting before inspection
   a) Impact Test
   b) Visual Inspection
   c) Sound Test
   d) Pressure Test

15. Which of the following terms changes in eddy current testing method for detection of defects in casting?
   a) Resistance
   b) Impedence

c) Conductivity
d) Capacitance

16. What is the approximate mix proportion for M15
    a) 1:3:6
    b) 1:2:4
    c) 1:1.5:3
    d) 1:1:2

17. In ACI method of mix design for given slump & MSA which of the following is determined
    a) Slump value
    b) The maximum size of aggregate
    c) Amount of mixing water
    d) Minimum water cement ratio

18. Relation of rate of creep and time is
    a) increases
    b) decreases
    c) depends on temp.
    d) is not affected

19. Reduction in volume due to shrinkage causes
    a) Low volume
    b) Volumetric strain
    c) Volumetric stress
    d) Change in W/C ratio

20. Symptoms for Aggressive ACR reaction is
    a) Disintegration of concrete evident by loss of cement paste
    b) Concrete surface very rough in areas where paste is leached
    c) Affected concrete ehibit telltale features too distinctly
    d) Expansion does not occur without reaction products

Q2. Attempt any FOUR **(04 X 05 marks= 20 marks)**

1. Explain properties of fresh concrete.
2. Write short note on vacuum concreting.
3. Explain with neat sketches cracking mechanism in FRC member subjected to flexure.
4. Write short note on Properties of metallic fibres
5. With neat sketches explain half-cell potentiometer test.
6. Explain ACR in detail with equations

Q3. Attempt any TWO **(02 X 10 marks= 20 marks)**

1. Define hot weather concreting. What are the effects of hot weather concreting? What are the precautions to be taken during hot weather concreting?
2. Design a concrete mix by ACI method for the following data
    i. Characteristic compressive strength at 28 days = M20
    ii. Standard Deviation = 4.0
    iii. Nominal maximum size of aggregate = 20 mm
    iv. Type of Cement = Type 1
    v. Shape of CA = crushed aggregate
    vi. Workability = 100 mm slump
    vii. Type of exposure = mild
    viii. Dry rodded density of coarse aggregate = 1640 kg/m^3
    ix. Specific Gravity of cement = 3.15
    x. Specific Gravity of C.A = 2.78
    xi. Specific Gravity of F.A = 2.72
    xii. Degree of Supervision = Good
    xiii. Maximum water cement ratio = 0.50
    xiv. Fineness Modulus = 2.78
    xv. Aggregates are assumed to be in saturated surface dry condition
3. What is non-destructive testing of concrete? What are the various tests involved? Explain any one in detail with neat sketch?
4. Explain the behavior of hardened steel fiber reinforced concrete (SFRC) under compression. Comment the significance of change in stress- strain curve of SFRC when compared to plain and reinforced cement concrete.

(c)

Table 6 Approximate mixing water and air contents for different slumps and max. size of aggregates

Slump (mm)	Maximum quantity of water (kg/m³) for specified nominal maximum size of aggregate@							
	10	14	20	28	40	56*	80*	150*
1. Non-air-entrained concrete								
Stiff-plastic (25–50)	207	199	190	179	166	154	130	113
Plastic (75–100)	228	216	285	193	181	169	145	124
Flowing (150–175)	243	228	216	202	190	178	160	–
Approximate Entrapped air (%)	3.0	2.5	2.0	1.5	1.0	0.5	0.3	0.2
2. Air-entrained concrete								
Stiff-plastic (25–50)	181	175	168	160	150	142	122	107
Plastic (75–100)	202	193	184	175	165	157	133	119
Flowing (150–175)	216	205	197	184	174	166	154	–
3. Recommended average total air content (%)								
Mild exposure	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
Moderate exposure	6.0	5.5	5.0	4.5	4.5	4.0	3.5	3.0
Severe exposure	7.5	7.0	6.0	6.0	5.5	5.0	4.5	4.0

Table 7: Water-Cement Ratio and Compressive Strength Relationship

28-day compressive strength# (N/mm²)	Water/cementing material ratio by mass*	
	Non-air-entrained concrete	Air-entrained concrete
45	0.38	0.30
40	0.42	0.34
35	0.47	0.39
30	0.54	0.45
25	0.61	0.52
20	0.69	0.60
15	0.97	0.70

Table 8: Volume of Coarse Aggregate per Unit Volume for Different Fine aggregate Fineness Moduli

Nominal maximum size of coarse aggregate (mm)	Bulk volume of oven-dry-rodded coarse aggregate (m³) fineness modulus of fine aggregate			
	2.40	2.60	2.80	3.00
10	0.50	0.48	0.46	0.44
14	0.59	0.57	0.55	0.53
20	0.66	0.64	0.62	0.60
28	0.71	0.69	0.67	0.65
40	0.75	0.73	0.71	0.69
56	0.78	0.76	0.74	0.72
80	0.82	0.80	0.78	0.76
150	0.87	0.85	0.83	0.81