

Enroll No

Q.P.Code

E218

Course Code: CCM1010

Course Name: Construction Planning and Scheduling

Day & Date: Wed., 01/03/2023

Time : 2.30 to 5.30 pm.

Max Marks: 100

- Instructions:**
- 1) All questions are compulsory
 - 2) Figures to the right indicate maximum marks
 - 3) Assume suitable data if not given
 - 4) Use of non-programmable calculator is allowed

Q.1 Attempt any TWO

- (a) Prepare a project plan for the building construction project. Highlight important phases of the project. Prepare the resource planning/requirement chart, time chart, and fund requirement (% value of the total cost) chart with respect to various phases of the project. 08 CO1
- (b) Explain Work Break Down structure for residential building construction project. 08 CO1
- (c) Explain the concept of Project Deliverables. List out key project deliverables for a highway construction project. 08 CO1

Q.2 Attempt any TWO

- (a) Explain how precedence diagramming method is different from critical path method of project scheduling. 08 CO1
- (b) Discuss updating of the project activities with reference to critical path method and bar chart. 08 CO1
- (c) Draw a typical bar chart for building construction project and discuss the relationship between different activities of the project. 08 CO1

Q.3 Attempt any TWO

- (a) Discuss project estimates and project schedules with appropriate example. 08 CO2
- (b) Discuss uncertainty in the estimation of activity time duration. 08 CO2
- (c) Discuss parametric model and bottom up estimate techniques of activity time estimation. 08 CO2

- Q.4 (a) The activities involved in Alpha Manufacturing Company are given in the following table, with their time estimates. Draw the network for the given activities and prepare activity table showing EST, EFT, LST, LFT, Total Float and Free float. 12 CO3

Activity	Description	Immediate predecessor	Duration (Days)
L	Forecast sales volume	--	10
M	Study competitive market	--	7
N	Design items & facilities	L	5
O	Prepare production plan	C	3
P	Estimate cost of production	O	2
Q	Set sales price	M, P	1
R	Prepare budget	P, Q	14



- (b) The data pertains to small project is shown in the table below, draw network diagram and find project duration. As a monitoring activity, the review of work has been taken after 7 days and the following conditions exists 06 CO3
1. Activity 1-2 and 1-4 delays drastically and will require 7 and 8 days to complete respectively.
 2. Due to the arrival of the new machine Activity 3-5 requires 5 days in place of 3 days.
 3. Activity 6-7 is yet to start and its original time seems to be accurate.
- Update the network using the conditions given. Identify change in the Project duration.

Activity	1-2	1-4	2-3	3-5	5-6	6-7
Duration (Days)	8	7	4	3	12	9

OR

- (c) A civil engineering project consists of the activities given in the table below: 06 CO3

Activity	1-2	1-5	2-3	3-4	4-7	5-6	6-7
Duration(Days)	5	3	7	2	4	2	2

At the end of 6th days, it is observed that

Activities 1-2 and 1-5 have been completed.

Activity 2-4 is being done and will be completed in 8 more days.

Activity 5-6 is in progress and will need 1 more day to complete.

Activity 4-7 is presenting some problem and will take 5 days to complete.

Update the network using the conditions given. Identify change in the Project duration.

- Q.5 (a) Civil Engineering construction project consist of following activities. 12 CO3
Schedule the following project and find out critical path, critical duration, early start, early finish, late start, late finish, total float.

Activity	Predecessor	Duration
A	-	8
B	A(SS2)	9
C	A(FS2)	4
D	B(FS4)	5
E	D(FS-2)	6
F	E(FS2), C(FS5)	2
G	F(FS)	10
H	E(FS1)	5
I	F(FS0)	6

(If the relationship type is not mentioned, it implies finish to start (FS). If no lag is mentioned, consider it to be zero.)

- (b) With neat sketch discuss Finish to finish and Start to start types of relationships with reference to the construction project. 06 CO3

OR

- (c) Compare Precedence Diagramming method between Critical Path Method. 06 CO3

Q.6 Attempt any TWO

- (a) Discuss roles and responsibilities of Site Incharge and Project Sponsor 08 CO4
- (b) List different team members required for construction of bored cast-in-situ pile foundation. Prepare the responsibility matrix of the team members involved in this activity. 08 CO4
- (c) List out resources to be required for any construction project. Discuss the responsibilities of any two resources. 08 CO4



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End Semester Examination (2022-2023)
FYMTech. Civil-Construction Mgt. Sem- I

Q.P.Code
E234

Course Code: CCM1030

Course Name: Construction Equipment

Day & Date: Friday, 3/3/2023

Time : 2:30 to 5:30 pm

Max Marks: 100

- Instructions:** 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1

- (a) Align equipment with: 08 1
1. Removing soil from the depth of 8 ft.,
 2. Loading excavated material stored on ground,
 3. Spreading/Levelling windrow dumped by bottom dump truck
 4. Spray water to increase the moisture content in the soil.

- (b) Discuss three significant developments which improved the capacity and productivity of equipment. 07 1

OR

- (b) Discuss blade adjustment of dozer and their applications. 07 1

Q.2

- (a) Explain the operations performed by grader. 08 1
- (b) Discuss the rock properties which favor ripping. 07 1

OR

- (b) Discuss various types of scrapers and their applications 07 1

Q.3

- (a) A contractor wants to investigate the production and cost differences of using a 7S blade on a D7H dozer or an S blade on an 824 dozer. The material is a dry clay, and it is to be moved a distance of 200 ft from the beginning of the cut. The dozing is uphill on a 5% grade. The operator will have average skill, the dozers have power-shift transmissions, and traction is assumed to be satisfactory. The site will be dusty. The material weighs 98 pcf in the bank state. Job efficiency is assumed to be equivalent to a 50-min hour. Calculate the direct cost of the proposed earthmoving operation in dollars per bcy. Assume that the O&O cost for the D7 dozer is \$76.00 per hour and \$73.00 per hour for the 824. The operator's wage is \$16.00 per hour plus 35% for fringes, worker's compensation, and other benefits. a. Which machine would you use on this job? 15 2



OR

- (a) A shovel with a 3-cy heaped capacity bucket is loading well-blasted rock on a highway project. The average face height is expected to be 22 ft. The shovel has a maximum rated digging height of 30 ft. Most of the cut will require a 140° swing of the shovel to load the haul units. What is a conservative production estimate in bank cubic yards? Assume efficiency 30 min/Hr. and cycle time of 21 sec. 15 2
- (b) The power-shift dozer of 200 Hp. will be used to push material 90 ft. Use the manufacturers formula to calculate the lcy production that can be expected for this operation. 05 2

Q.4

- (a) Discuss the cycle time of scrapper. 05 1
- (b) Discuss, meaning of fleet, list equipment required in a fleet for excavation and hauling activity. 05 3
- (c) List the components of equipment fleet. 05 3

Q.5

- (a) Provide the classification of trucks. 10 1
- (b) Draw a labeled flow chart of drum mix asphalt plant. 10 3

OR

- (b) Draw a labeled flow chart of RMC plant. 10 3

Q.6

- (a) Match the elements as ownership or operating cost: 10 4

Sr. no.	Elements	Belongs to
1	Salvage value	
2	Storage	
3	Tires	
4	Repair and replacement	
5	Tax	
6	Purchase value	
7	Lubricants	

- (b) State the elements of ownership cost. 05 4

OR

- (b) State the elements of operating cost. 05 4



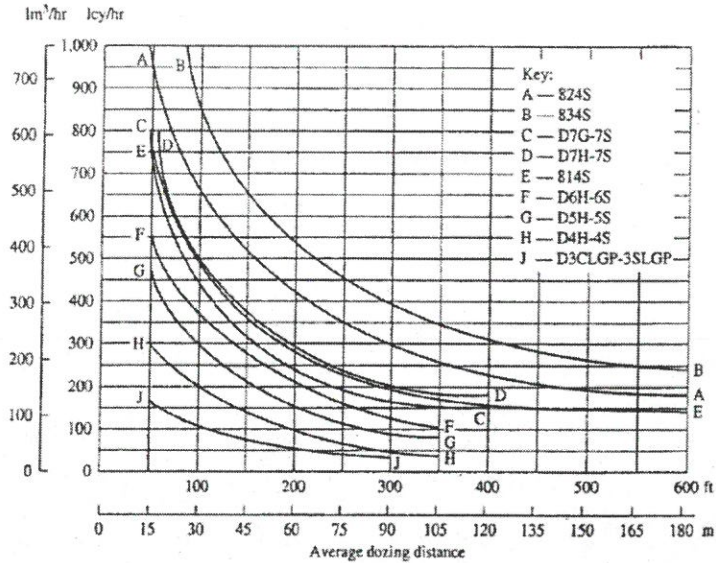
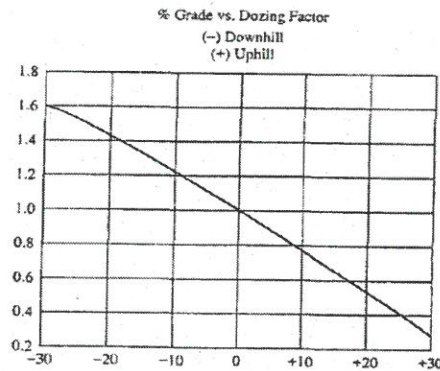


FIGURE 7.13 Dozing production estimating curves for straight blade Caterpillar D3, D4, D5, D6, D7, 814, 824, and 834 dozers equipped with straight blades.
 Reprinted courtesy of Caterpillar Inc.

TABLE 7.2 Caterpillar job condition correction factors for estimating dozer production.

	Track-type tractor	Wheel-type tractor
Operator		
Excellent	1.00	1.00
Average	0.75	0.60
Poor	0.60	0.50
Material		
Loose stockpile	1.20	1.20
Hard to cut; frozen		
with tilt cylinder	0.80	0.75
without tilt cylinder	0.70	—
cable-controlled blade	0.60	—
Hard to drift; "dead" (dry, noncohesive material) or very sticky material	0.80	0.80
Rock, ripped or blasted	0.60–0.80	—
Slot dozing	1.20	1.20
Side-by-side dozing	1.15–1.25	1.15–1.25
Visibility		
Dust, rain, snow, fog, or darkness	0.80	0.70
Job efficiency		
50 min/hr	0.83	0.83
40 min/hr	0.67	0.67
Direct-drive transmission (0.1-min fixed time)	0.80	—
Buildozer*		
Adjust based on SAE capacity relative to the base blade used in the estimated dozing production graphs		
Grades—see the graph		



*Note: Angling blades and cushion blades are not considered production-doing tools. Depending on job conditions, the A blade and C blade will average 50–75% of straight-blade production.
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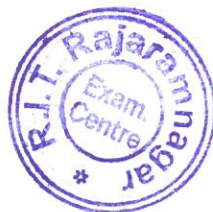


TABLE 9.1 Fill factors for front shovel buckets.

Material	Fill factor* (%)
Bank clay; earth	100-110
Rock-earth mixture	105-115
Rock—poorly blasted	85-100
Rock—well blasted	100-110
Shale; sandstone—standing bank	85-100

TABLE 9.2 Factors for height of cut and angle of swing effect on shovel production.

Percentage of optimum depth	Angle of swing (degrees)						
	45	60	75	90	120	150	180
40	0.93	0.89	0.85	0.80	0.72	0.65	0.59
60	1.10	1.03	0.96	0.91	0.81	0.73	0.66
80	1.22	1.12	1.04	0.98	0.86	0.77	0.69
100	1.26	1.16	1.07	1.00	0.88	0.79	0.71
120	1.20	1.11	1.03	0.97	0.86	0.77	0.70
140	1.12	1.04	0.97	0.91	0.81	0.73	0.66
160	1.03	0.96	0.90	0.85	0.75	0.67	0.62

TABLE 4.3 Representative properties of earth and rock.

Material	Bank weight		Loose weight		Percent swell	Swell factor*
	lb/cy	kg/m ³	lb/cy	kg/m ³		
Clay, dry	2,700	1,600	2,000	1,185	35	0.74
Clay, wet	3,000	1,780	2,200	1,305	35	0.74
Earth, dry	2,800	1,660	2,240	1,325	25	0.80
Earth, wet	3,200	1,895	2,580	1,528	25	0.80
Earth and gravel	3,200	1,895	2,600	1,575	20	0.83
Gravel, dry	2,800	1,660	2,490	1,475	12	0.89
Gravel, wet	3,400	2,020	2,980	1,765	14	0.88
Limestone	4,400	2,610	2,750	1,630	60	0.63
Rock, well blasted	4,200	2,490	2,640	1,565	60	0.63
Sand, dry	2,600	1,542	2,260	1,340	15	0.87
Sand, wet	2,700	1,600	2,360	1,400	15	0.87
Shale	3,500	2,075	2,480	1,470	40	0.71

*The swell factor is equal to the loose weight divided by the bank weight per unit volume.

TABLE 9.4 Fill factors for hydraulic hoe buckets.

Material	Fill factor* (%)
Moist loam/sandy clay	100-110
Sand and gravel	95-110
Rock—poorly blasted	40-50
Rock—well blasted	60-75
Hard, tough clay	80-90



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End Semester Examination (March-2023)
FYMTech. Civil-Construction Mgt. Sem- I

Q.P.Code
E247

Course Code: CCM1050

Course Name: Construction Practices

Day & Date: Monday, 06/03/2023

Time : 2:30 to 5:30 pm.

Max Marks: 100

- Instructions:** 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1

- | | | |
|--|----|---|
| (a) Distinguish between bored piles and driven piles. | 06 | 2 |
| (b) Discuss the process of construction of bored pile. | 10 | 1 |

OR

- | | | |
|---|----|---|
| (c) Write a method statement of construction of pile in hard rock, using hammer and bailor. | 10 | 1 |
|---|----|---|

Q.2

- | | | |
|--|----|---|
| (a) State advantages and disadvantages of trenchless technology. | 06 | 2 |
| (b) Explain trenchless methods used for new construction. | 10 | 1 |

OR

- | | | |
|---|----|---|
| (b) Discuss with neat sketch process of pipe jacking. | 10 | 1 |
|---|----|---|

Q.3

- | | | |
|---|----|---|
| (a) Clint wants to construct a lake front resort, near to large and deep lake, as per design the founding depth is 3 meters, soil is permeable, choose a dewatering method you will select in order to keep foundation area dry. Reason your selection. | 10 | 3 |
|---|----|---|

OR

- | | | |
|--|----|---|
| (a) Explain different methods of dewatering used on construction projects. | 10 | 1 |
| (b) Explain the procedure of dewatering using multi stage well point system. | 08 | 1 |



Q.4

(a) As large and heavy ships are manufactured, the depth of docks and harbors needs to be deepened, on the project where soft strata is available, dock needs to be deepened by 3 meters in soft strata, select dredging method for the task and explain the process. 10 3

(b) Discuss dredging operation using continuous operating equipment. 08 1

OR

(b) List and explain factors to be considered for selection of dredging equipment. 08 1

Q.5

(a) Explain the method of construction of diaphragm wall. 10 2

(b) Explain the method of construction of single wall cofferdam. 06 2

OR

(b) Discuss method of driving sheet piles for cofferdam construction. 06 2

Q.6

(a) Discuss the need for construction of high-rise structures 08 3

(b) Discuss structural systems used for construction of high-rise structures. 08 3

OR

(b) Discuss types of foundations used in construction of high-rise building. 08 3



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End Semester Examination
First Year M. Tech. Civil (CM) Sem-I
Course Code: CCM1070

Q.P. Code
E 258

Course Name: Quality Assurance and Quality Control in Construction

Day & Date: Wednesday, 08/03/2023

Time: 2.30 pm to 5.30 pm

Max Marks: 100

Instructions: 1) All questions are compulsory
2) Assume suitable data if not given

- Q.1 17 COs
- Marks
- (a) Discuss briefly about the quality cycle and its implementation 07 CO 1
- OR**
- (b) Criticize the statement " quality assurance and quality control can be used as interchangeable" 07 CO 1
- (c) Briefly explain the dimensions of product quality. 10 CO 1
- Q.2 17 COs
- Marks
- (a) Discuss three primary application of control charts. 07 CO 2
- OR**
- (b) How do you interpret control charts Explain the possible causes of different out of control indicators? 07 CO 2
- (c) The number of non-conforming or defectives for 10 samples of varying sample sizes are given below. Construct a 'p' chart. (varying sample size) 10 CO 2

Sample Number	Number non-conforming	Sample Size
1	18	137
2	20	158
3	14	92
4	6	122
5	11	86
6	22	187
7	6	156
8	9	117
9	14	142
10	12	140



Q.3		16	
		Marks	
(a)	Design checklist for steel (reinforcement) before the unloading on site from supplier	08	CO 3
	OR		
(b)	Briefly discuss about Role and Responsibility of Departmental Engineers.	08	CO 3
(c)	What can be the guidelines to be considered for preparation of checklist for Brickwork?	08	CO 4
Q.4		16	COs
		Marks	
(a)	Briefly describe requirements for building services as per NBC guidelines.	08	CO 4
	OR		
(b)	Describe fire safety requirements and methods for high rise building	08	CO 4
(c)	What guidelines are provided for structural adequacy of buildings and usage of materials and technology for building design	08	CO 4
Q.5		17	Cos
		Marks	
(a)	Describe the benefits of ISO registration.	07	CO 4
	OR		
(b)	Explain the management's responsibility for ISO implementation.	07	CO 4
(c)	Explain the elements of ISO 9000 standards.	10	CO 4
Q.6		17	Cos
		Marks	
(a)	Write note on remedial strategy to reduce NCR's.	07	CO 1
	OR		
(b)	Briefly describe internal quality auditing procedures	07	CO 1
(c)	Construct House of Quality (HoQ) with its entire element with step by step process.	10	CO 3



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End Semester Examination (JAN/FEB 2023)
FY. M. Tech. Civil-Construction Mgt. Sem- I

Q.P.Code
E270

Course Code: CCM1115

Course Name: PE-I – Disaster Management

Day & Date: Friday, 10/03/2023

Time : 02:30 to 5:30 p.m.

Max Marks: 100

- Instructions:** 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1 Answer the following Questions

- (a) Outline natural and manmade disaster. 9 Marks CO1
(b) Discuss the reasons of floods and highlight the mechanism for mitigation to reduce the risk during such event. 9 Marks CO1

OR

- (b) Discuss the vulnerability of India for earthquake related disaster. 9 Marks CO1
Comment on India's preparedness to handle such an event.

Q.2 Answer the following Questions

- (a) With the help of a neat diagram, explain various phases in Disaster management. 8 Marks CO1
(b) Highlight the importance of community-based disaster risk reduction. 8 Marks CO2

OR

- (b) Vulnerability is an essential element for defining disaster impacts and its threats to the people. How and in what ways can vulnerability to disaster be characterized? Discuss different types of vulnerability with reference to disaster. 8 Marks CO2

Q.3 Answer the following Questions

- (a) Discuss the role played by Central and State Administration in disaster response. 8 Marks CO3
(b) What are the general capabilities of the armed forces for providing immediate assistance for disaster? 8 Marks CO3



Q.4 Answer the following Questions

- (a) Response is the first stage of the Disaster Management Cycle. Discuss. 8 Marks CO4
- (b) Recently Remote Sensing is playing an important role disaster management. Explain with reference to cyclone. 8 Marks CO4

OR

- (b) Assess the coordination and control mechanism at nation, state and local level. 8 Marks CO4

Q.5 Answer the following Questions

- (a) Highlight the role of stakeholders in the effective implementation of response plans. 8 Marks CO4
- (b) Explain briefly the value of preparing and maintaining inventories for logistics management. 8 Marks CO3

OR

- (b) Explain the statement 'Disaster is an opportunity for development'. 8 Marks CO3

Q.6 Answer the following Questions

- (a) Assessment is the appraisal of any given situation prior to an intervention. Discuss. 8 Marks CO5
- (b) Suppose, you are appointed as in charge of Disaster management Cell of a district which is categorized under Zone V for earthquake. Discuss in brief your action plans towards the following points. 10 Marks CO5
1. Prevention and mitigation of disaster.
 2. Early warning system, preparedness and capacity development.
 3. Awareness, Evacuation and disaster communication.



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End Semester Examination (~~Mar~~ - 2023)
FYMTech. Civil-Construction Mgt. Sem- I

Q. P. Code
E284

Course Code: CCM1175

Course Name: PE-II – Bridge Construction

Day & Date: Mon. 13/3/2023

Time : 02:30 to 5:30 pm.

Max Marks: 100

- Instructions:** 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1 Solve any two	Marks	COs
(a) Mention the way in which Bridges are classified?	08	CO1
(b) Briefly outline the development of bridges?	08	CO1
(c) Enlist the types of surveys and geological investigations required before the actual execution of Bridge?	08	CO1
Q.2 Solve any two		
(a) How you will make identification of bridges, when there are multiple bridges on single route? Give suitable example.	08	CO2
(b) Predict the factors to be considered while selecting the site for a proposed bridge construction?	08	CO2
(c) Discuss how you would compute Seismic forces bridge?	08	CO2
Q.3 Solve any two		
(a) Describe the loads and trusses to be considered while designing highway bridges?	08	CO3
(b) Express the cause for longitudinal forces on bridges	08	CO3
(c) State how the dynamic effect is considered in railway bridge design?	08	CO3
Q.4 Solve any two		
(a) Sketch the typical cross section of box girder highway bridge and also give the advantages of box girder construction?	08	CO3
(b) Discuss IRC standard loadings and indicate the conditions under which each should be used?	08	CO3



(c) Discuss why most marine piles are circular in cross section? 08 CO3

Q.5 Solve any three

(a) Compare the advantages of assigning the central pier over the abutment as fixed piers? 06 CO2

(b) In bridge widening projects, the method of stitching is normally employed for connecting existing deck to the new deck. What are the problems associated with this method in terms of shrinkage of concrete? 06 CO2

(c) In designing the lateral resistance of piles, should engineers only use the earth pressure against pile caps only? 06 CO2

(d) Predict suitable method to tackle negative skin friction? 06 CO2

Q.6 Solve any three

(a) Discuss how you will determine the size of elastomeric bearings? 06 CO5

(b) Explain the consideration in selecting the orientation of wing walls in the design of bridge abutments? 06 CO5

(c) Polytetrafluoroethylene (PTFE) is commonly used in sliding bearings. Justify the statement? 06 CO5

(d) Conclude how do engineer determine the number of cells for concrete box girder bridges? 06 CO5



A

Enroll No

K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute, affiliated to SUK)
End Semester Examination (JAN/FEB 2023)
FYMTech. Civil-Construction Mgt. Sem- I

Q.P.Code
F285

Course Code: CCM1210 **Course Name:** PE-II – Advanced Concrete Technology

Day & Date: Mon., 13/03/2023
Time : 2.30 to 5.30 pm

Max Marks: 100

- Instructions:** 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1 Solve question a or b. Question c is compulsory

(a) Explain the process of clinker formation with the help of neat diagram along with the morphology of cement clinker and cement grain. 8 CO1 Marks

OR

(b) Explain chemical composition, morphology and function of,
a. Cement compounds 8 CO1 Marks
b. Hydration Products.

(c) Explain the cement hydration reaction with the help of time vs heat of hydration plot. 9 CO1 Marks

Q.2 Solve question a or b. Question c is compulsory

(a) Explain chemical composition, physical characteristics, interaction with processes of hydration and effects on properties of concrete in case of, 8 CO1 Marks
a. Fly ash
b. GGBFS

OR

(b) Explain chemical composition, physical characteristics, interaction with processes of hydration, application and effects on properties of concrete in case of, 8 CO1 Marks
a. Water reducers
b. Set control admixtures

(c) Critique upon use of supplementary cementitious materials in concrete. 9 CO1 Marks



Q.3 Solve question a or b. Question c is compulsory

- (a) Explain why concrete fails in a brittle manner in tension but not in compression. 8 CO2
Marks

OR

- (b) Explain any two various rheological models of concrete. 8 CO2
Marks
- (c) Discuss why the strength of the interfacial transition zone is generally lower than the strength of the bulk hydrated cement paste. 9 CO2
Marks

Q.4 Solve question a or b. Question c is compulsory

- (a) Critique upon chemical composition of cement with respect to its impact on the properties of fresh concrete. 8 CO2
Marks

OR

- (b) Analyze the way creep influence the quality and serviceability of a concrete structure. 8 CO2
Marks
- (c) Explain the mechanism of plastic shrinkage in concrete with the help of neat diagram. 9 CO2
Marks

Q.5 Solve question a or b. Question c is compulsory

- (a) Explain in detail the quality assessment and control measures needed to be taken during the concreting process 8 CO3
Marks

OR

- (b) Explain the precautions to be taken to maintain the construction quality during for mixing, placing and pumping of concrete on site. 8 CO3
Marks
- (c) Explain the cause of the bulking phenomenon in sand. Explain the role does it play in concrete manufacturing practice on site. 9 CO3
Marks

- Q.6** Design Self Compacting Concrete as per the provisions of IS:10262 and IS:456 for the given data, 15 CO4
Marks

- (a) Characteristic compressive strength required in the field at 28 days' grade designation — M 35
- (b) Nominal maximum size of aggregate — 20 mm
- (c) Shape of CA — Angular
- (d) Degree of workability required at site — 75-100 mm (slump) SF3 (slump flow 760 mm – 850 mm)
- (e) Degree of quality control available at site — Good As per IS:456
- (f) Type of exposure the structure will be subjected to (as defined in IS: 456) — Severe (for reinforced concrete)
- (g) Type of cement: OPC 43 grade conforming to IS 269
- (h) Method of concrete placing: pumping
- (i) Specific gravity of cement — 3.15
- (j) Specific gravity of FA — 2.64



- (k) Specific gravity of CA — 2.74
- (l) Aggregate are assumed to be in saturated surface dry condition.
- (j) Fine aggregates confirm to Zone II of Table 9 of IS 383
- (k) Free (surface) moisture in CA and FA- Nil (absorbed moisture also nil)
- (l) Water absorption 1) Coarse aggregate : 0.5 %
2) Fine aggregate : 1.0 %
- (m) Chemical admixtures type
1) Superplasticizer : normal (PCE type)
2) Viscosity modifying agent
Specific gravity of Chemical admixtures : 1.08
- (n) Mineral admixture : Fly ash conforming to IS 3812 (Part 1)

END

Appendix (Tables from IS:456-2000)

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 and 9.1.2)

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m ³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m ³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
i)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	—	300	0.55	M 20
iii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

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7 WORKABILITY OF CONCRETE

7.1 The concrete mix proportions chosen should be such that the concrete is of adequate workability for the placing conditions of the concrete and can properly be compacted with the means available. Suggested ranges of workability of concrete measured in accordance with IS 1199 are given below:

Placing Conditions (1)	Degree of Workability (2)	Slump (mm) (3)
Blinding concrete; Shallow sections; Pavements using pavers	Very low	See 7.1.1
Mass concrete; Lightly reinforced sections in slabs, beams, walls, columns; Floors; Hand placed pavements; Canal lining; Strip footings	Low	25-75
Heavily reinforced sections in slabs, beams, walls, columns; Slipform work; Pumped concrete	Medium	50-100 75-100
Trench fill; In-situ piling	High	100-150
Tremie concrete	Very high	See 7.1.2

NOTE—For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall be determined based on the density and spacing of reinforcement bars and thickness of sections. For tremie concrete, vibrators are not required to be used (see also 13.3).

