Class Test II GPC Jodhpur MM 15
CE 202 Fluid Mechanics TIME 1 HR

1. Write Bernoulli's theorem (बेरनौली प्रमेय) and continuity equation (सांतत्य प्रमेय). A pipe is 120m above sea level and has pressure of 0.7kg/cm^2 and velocity of 3m/sec. Find the total energy at that this point.
   एक पाइप समुद्र से is 120m ऊपर है और इसका दाब 0.7kg/cm2 है और वेग 3m/sec है। इस बिन्दु पर कुल ऊर्जा ज्ञात करे। (7.5)
2. Write short note on coefficient of velocity (वेग गुणांक), coefficient of contraction(संकुचन गुणांक) and coefficient of discharge (निसरण गुणांक). A narrow orifice has diameter of 2.5 cm and Cd=0.6 and Cc=0.62. If water drops at horizontal distance of 1 m at vertical distance of 10 cm. find head of orifice center. (7.5)

एक पतले orifice का व्यास 2.5 cm और Cd=0.6 Cc=0.62 है। यदि प्रधार 1 m की क्षेतीज दूरी में 10 cm गिर जाता है तब orifice के केंद्र पर शीर्ष ज्ञात करे।

Solution1.

Bernaul's theorem states that in a steady, ideal flow of an incompressible fluid the total energy at any point of the fluid is constant. The total energy consist of pressure energy , kinetic energy and potential energy.

Continuity equation is based on conservation of mass and states that for steady flow liquid flowing through any cross section is constant .

Total energy =potential energy+ kinetic energy+ pressure energy

=120+0.46+7=127.46m

Solution 2.

Coefficient of velocity= $\frac{Ctual\ velocity}{theoritical\ velocity}$

Coefficient of contraction=$\frac{area\ of\ venacontra}{theoritical\ area\ of\ opening}$

Coefficient of discharge =$\frac{actual\ discarge}{theroritical\ discahrge}$

Coefficient of discharge = Coefficient of velocity * Coefficient of contraction

Coefficient of velocity= 0.967

Assume head is H

C_v= $\frac{x}{2\sqrt{yH}}$,

H=2.67M

Class Test II	GPC Jodhpur	MM 15
CE 205	Transportation engineering	TIME 1 HR

Attempt any three (कोई भी तीन प्रशन हल करे)

1. Difference between temporary and permanent bridges.(अस्थायी और स्थायी पुल)
2. Difference between surface and subsurface drainage. (सतही और अध सतही निकासी)
3. What do you understand by uniformity of gauges? What are advantages and disadvantages of it?
   गेज की एकसरता से आप क्या समझते है? इसके लाभ और हानिया क्या है?
4. Explain road side arboriculture. (सड़क पेड़-सवर्धन)
5. Conning of wheels (पहिये का सांक्विकरण)

Solution 1.

Permanent bridges are costly to construct and maintain , takes long time to construct and cannot be removed easily. It needs detailed studies before constructing same. They are used where heavy traffic load is expected. Temporary bridges are easy to construct with low construction and maintenance cost. They can be easily removed and used in places where traffic load is low.

Solution 2.

Surface drainage is used to remove surface water. In it water in collected in series of drains and then finally moved to larger drains. It can be used to large amount of water.

Sub surface drainage is used to remove underground water and its main aim is to lower water table and remove capillary water . It can cater only small amount of water and drainage is done through series of underground perforated pipes.

Solution 3.

By uniformity of gauges we mean gauge length is same throughout the network.

Advantages

- Fast movement of goods and services
- Low maintenance cost.
- More economic
- Saves labor cost for loading and unloading

Disadvantages-

- High cost
- Difficult to construct in hilly areas
- May not be economical in remote locations.

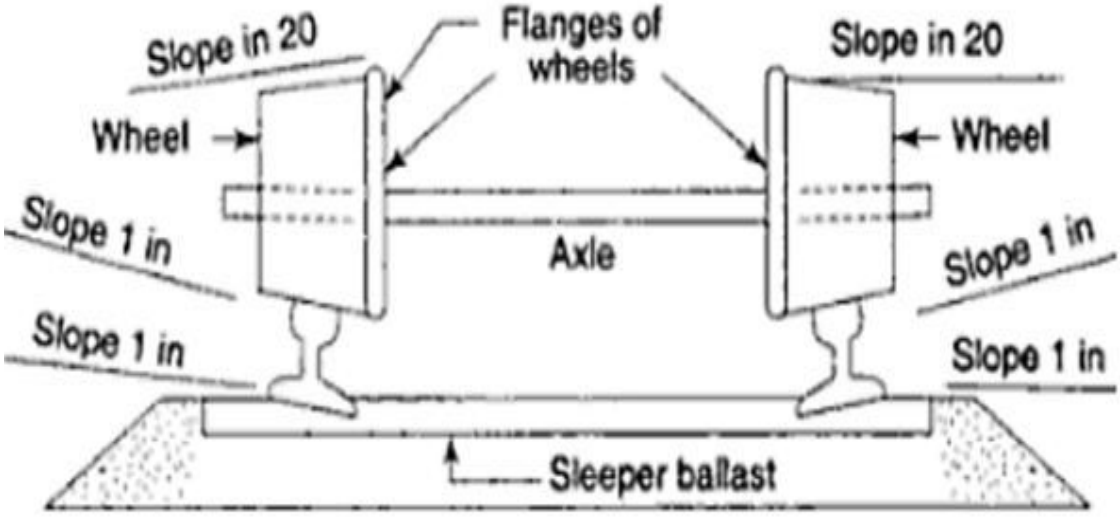
Solution 4.

By Arboriculture we mean planting of trees on roadside.

- Provide attractive landscaping
- Provide shade to road users
- Protect against sand in desert areas.
- Help in lowering water table near road.
- Help in controlling sound pollution

Solution 5.

- The flanges of wheel is never made flat, but they are in the shape of cone with a slope of 1 in 20
- The coning of wheels is mainly done to maintain the vehicle in the central position with respect to the track



M.M.-15
Time-1 Hr.

CE- 204 Surveying-I
Class Test –II

Attempt any two Question

1. Draw a neat labeled sketch of a Dumpy level and explain its main parts.
2. Explain the characteristics' of contour lines
3. The following continuous readings were taken with a level and 3m staff on a Continuous sloping ground at 20 m interval. Calculate the reduced levels of all the point, if the R.L. of the first point is 192.122m. Calculate the gradient of the line joining the first and last point.

O.602, 1.234, 1.860, 2.574, 0.238, 0.914, 1.936, 2.872, 0.568, 1.824, 2.722.

Class Test –II

CE- 204 Surveying-I

1. Draw a neat labeled sketch of a Dumpy level and explain its main parts

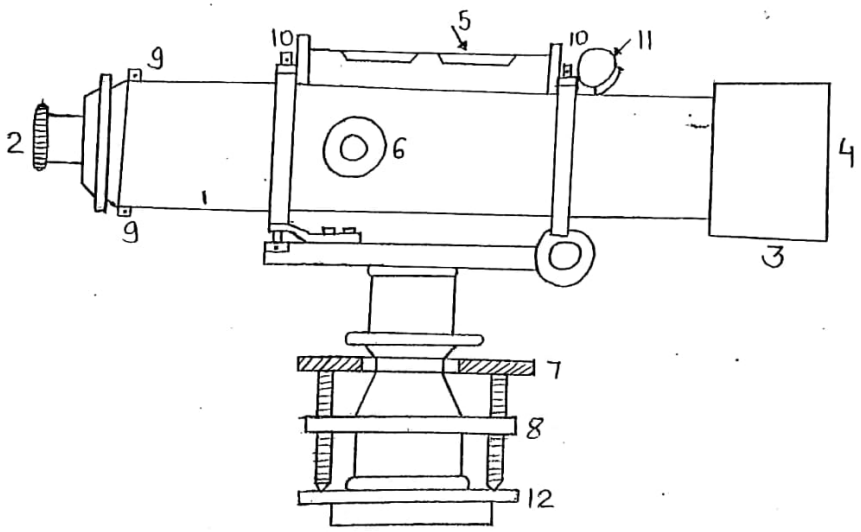
Sol- एक Dumpy level के निम्न मुख्य भाग होते है।

1. दुरबीन –(Telescope)- इससे दृष्टि– रेखा (line of sight) स्थापित की जाती है। इसमे दो उतल लैंस काम मे लाये जाते है। लक्ष्य (object) की तरफ के लैंस को अभिदृष्य लैंस (object Lens or objective) कहते है। और ऑख के पास वाले को नेत्रिका करते है। नेत्रिका (Eye-Piece) ओर अभिदृष्य लैंस के केन्द्र से गुजरने वाली रेखा दृष्टि रेखा कहलाती है।

2. पाणसल (Level Tube) इससे दृष्टि– रेखा को क्षैतिज किया जाता है जब पाणसल का बुलबला मध्य मे होता है तो दृष्टि– रेखा क्षैतिज रहती है।

3. समतलन अवयन (Levelling Head)- इससे पाणसल के बुलबले को केन्द्र मे किया जाता है । समतलन अवयन दो प्रकार का हो सकता है– (a) तीन पेचों वाला समतलन अवयन (Three Screw levelling head), (b) चार पेचों वाला समतलन अवयन (Four Screw levelling head)

4. त्रिपाद (Tripot)– इसके उपर लेवल यन्त्र को कसकर रखने की व्यवस्था रहती है।



1. Telescope
2. Eye-piece
3. Ray shade
4. Objective end
5. Longitudinal bubble
6. Focusing screws
7. Foot screws
8. Upper parallel plate (Tribrach)
9. Diaphragm Adjusting screws
10. Bubble Tubl adjusting screws
11. Transverse bubble tube
12. Foot plate (Trivet stage)

Dumpy level

Sol-2Characteristies of contours

1- दो असमान उँचाई की समोच्च रेखायें आपस में एक–दुसरे को नही काट सकती । परन्तु एक प्रलम्बी शैल (Overhanging cliff) या गुफा की स्थिति मे समोच्च रेखाए एक दुसरे को काट सकती है।

2. यदिसमोच्च रेखाए एक दुसरे के अधिक पास हो तो वे अधिक ढाल को प्रदर्शित करती है। यदि दुर–दुर है तो कम ढाल को दर्शाति है।

3. एक बिन्दु से गुजरने वालीसमोच्च रेखाए उस बिन्दु पर अधिकतम ढाल की दिशा के अभिलम्ब होती है।

4. एक संवॅृत समोच्च रेखाए के धेरे के अन्दर यदि एक या अधिक समोच्च रेखाए हो जिनकी उँचाई अन्दर की ओर बढ रही हो तो एक पहाडी को प्रदर्शित करती है।

और यदि इनकी उँचाई अन्दर की ओर कम हो रही होतो वह तालाब ,झील या गई (depression) का द्योतक है

5. हर समोच्च रेखा संवृत होनी चाहिए।

6. समोच्च रेखा एक जल विभाजन रेखा (water shed line) या काठी (ridge line)रेखा को समकोण पर पार करती है। Ridge line पर U नुमा वक्र बनता है।

7. समोच्च रेखा एक घाटी रेखा (valley line) को भी अभिलम्ब कटती है तथा एक उल्टा Vवक्र बनाती है।

Sol-3 Observation Table-

Station	Distance (m)	B.S	I.S.	F.S	H. I	R.L	Remarks
1	0	0.602			192.724	192.122	B.M
2	20		1.234			191.49	
3	40		1.860			190.864	
4	60	0.238		2.574	190.388	190.15	T.P.
5	80		0.914			189.474	
6	100		1.936			188.452	
7	120	0.568		2.872	188.084	187.516	T.P.
8	140		1.824			186.26	
9	160			2.722		185.362	

Sum BS =1.408 sum FS=8.168

Arithmetic Cheek

Sum BS- sum FS=1.408 -8.168

= -6.76

Last R.L –First R.L=185.362-192.122

=-6.76 O.KType equation here.

Gradient =R.L. difference between First & Last Station/Total distance

=(192.122-185.362)/160

=6.76/160

=1/23.67

GOVERNMENT POLYTECHNIC COLLEGE, JODHPUR

CLASS TEST – II (2017-2018)

TIME – 1 HR

MM- 15 MARKS

SUBJECT –CONCRETE TECHNOLOGY (CE -207)

Attempt any three questions कोई तीन प्रश्न हल करे

Q1 What are the effects of the following impurities in water on the properties of the concrete? पानी में उपस्थित अशुद्दियोका कंक्रीट के गुणों पर क्या प्रभाव होता है? - (1) अम्ल एवं क्षार Acids and Alkalis (2) अकार्बनिक लवन Inorganic salts. 5

Q2 Describe the factors affecting workability of the concrete. कंक्रीट की सुकार्यता को प्रभावित करने वाले कारको का वर्णन कीजिये | 5

Q3 What is the effect on cement concrete by Air Entraining admixtures? सीमेंट कंक्रीट में वायु उत्पन्न करने वाले कारको (सम्मिश्रण) का क्या प्रभाव होता है ?

Q4 Explain the compacting factor test for determining workability of cement concrete. सीमेंट कंक्रीट की सुकार्यता ज्ञात करने हेतु कोम्पक्टिंग फैक्टर परिक्षण को समजाये | 5

10/02/2018

Civil II^nd Year Regular
II^nd test CE-207
G.P.C. Jodhpur

Ans. 1.

(i) अम्ल ⇒ यदि पानी में हाइड्रोक्लोरिक, सल्फ्यूरिक व अन्य सामान्य अकार्बनिक अम्लों की सान्द्रता 1% तक हो तो इसका कंक्रीट की सामर्थ्य पर कुछ विशेष प्रतिकूल प्रभाव नहीं पड़ता है। इससे अधिक मात्रा होने पर कंक्रीट की सामर्थ्य व अन्य गुण काफी प्रभावित हो जाते हैं।

क्षार ⇒ NaOH की मात्रा सीमेन्ट के भार के 0.5% तक होने पर कंक्रीट कंक्रीट की सामर्थ्य पर कोई प्रतिकूल प्रभाव नहीं पड़ता है। इससे अधिक सान्द्रता से कंक्रीट की सामर्थ्य में कमी आ जाती है।

(ii) अकार्बनिक लवण ⇒ मैग्नीज, टिन, जस्ते, तांबा व सीसे के लवणों की पानी में उपस्थिति से कंक्रीट की सामर्थ्य घट जाती है। जस्ते व तांबे क्लोराइड की जमाव क्रिया को काफी धीमा कर देते हैं। लैड नाइट्रेट का प्रभाव बहुत विध्वंसक होता है।

Ans. 2.

कंक्रीट की सुकार्यता को प्रभावित करने वाले घटक निम्न हैं -

(i) पानी की मात्रा (ii) कणों का आकार
(iii) रासायनिक पदार्थ (iv) मिश्रित अनुपात
(v) मिलावे के ग्रेडिंग

(i) पानी की मात्रा ⇒ पानी की वांछित मात्रा से अधिक मात्रा कंक्रीट में मिलाने से उसकी सुकार्यता तो बढ़ जाती है परन्तु उसकी सामर्थ्य व घनत्व कम हो जाता है।

(ii) कणों का आकार ⇒ मिश्रण में बिना किसी परिवर्तन के मोर्टर मिलावे के कणों का अधिकतम आकार बढ़ाने से कंक्रीट की सुकार्यता बढ़ जाती है। कणों का आकार बढ़ाने से कणों की सतह कम हो जाती है। जिससे कणों की सतह भिगोने के लिए पानी की कम मात्रा की आवश्यकता होती है। कणों का आकार बढ़ जाने से उनके बीच रिक्तिका कम हो जाती है जिससे उसे भरने के लिए कम मसाले की आवश्यकता होती है।

(iii) रासायनिक पदार्थ ⇒ रासायनिक पदार्थ उपयोग करने से कंक्रीट सुकार्यता व जलसहगुण बढ़ाये जा सकते हैं। जैसे - कैल्सियम क्लोराइड की मिलाने की मात्रा सीमित है। इससे अधिक मिलाने पर इसकी सामर्थ्य पर प्रतिकूल प्रभाव पड़ता है।

(iv) मिश्रित अनुपात ⇒ मिलावे / सीमेन्ट का अनुपात सुकार्यता को प्रभावित करने वाला एक महत्वपूर्ण कारक होता है। मिलावा / सीमेन्ट का अनुपात जितना उच्च होगा कंक्रीट उतना ही क्षीण हो जायेगा।

(v) मिलावे की ग्रेडिंग ⇒ सुकार्यता को प्रभावित करने वाला यह एक महत्वपूर्ण कारक है। एक अच्छा ग्रेड युक्त मिलावा वह माना जाता है। जिसके दिए हुए आयतन में कम से कम रिक्तिकाएं हो।

303 वायु उत्पन्न करने वाले कारक प्रत्यक्ष रूप से कंक्रीट के निम्न तीन गुणधर्मों को प्रभावित करता है।

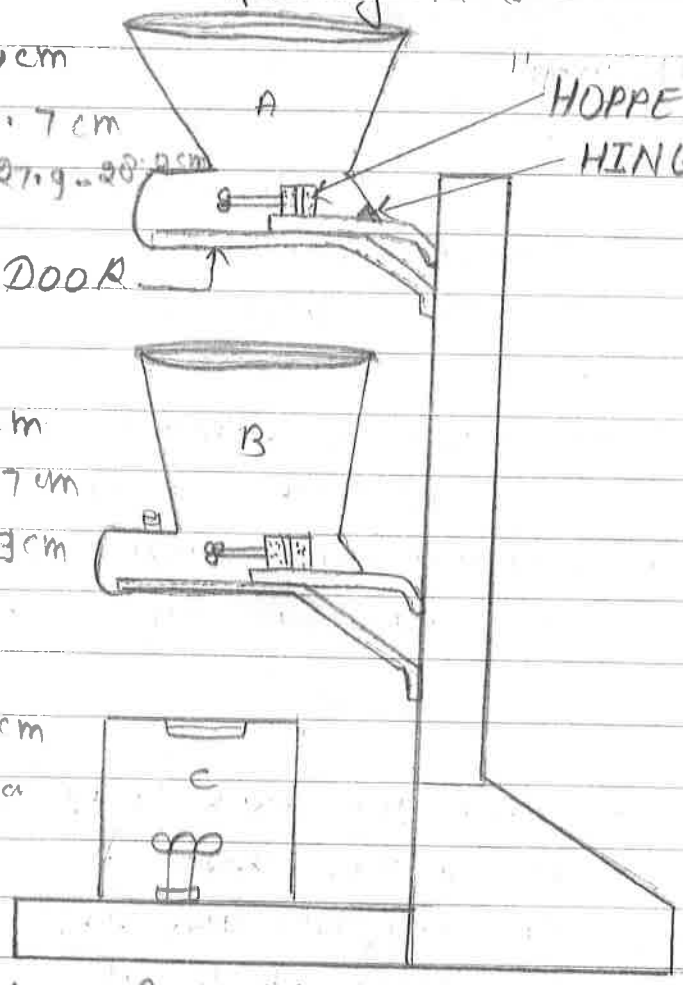
1. हिमीकरण एवं हिमद्रवण प्रतिरोधकता को बढ़ाता है।
2. सुकार्यता में सुधार करता है।

(iii) सामर्थ्य को कम करता है।

इसके साथ ही वायु उत्पन्न करने वाले कारक कंक्रीट के गुणधर्मो को निम्न प्रकार प्रभावित करते हैं -

(i) एकत्रीकरण की प्रवृत्ति को कम करता है
(ii) पारगम्यता को कम करता है।
(iii) उत्स्रवण (Bleeding) को कम करता है।
(iv) महीन मिलावे पानी एवं सीमेन्ट के प्रभाव को कम करता है।
(v) बर्फीर भार को कम करता है
(vi) रसायनिक प्रतिरोधकता में कमी करता है
(vii) घर्षण प्रतिरोकता को कम करता है

304 ⇒ कोम्पेकटिंग फैक्टर परीक्षण (Compacting factor test) ⇒



A = शिखर व्यास = २५.५ cm
= आन्तरिक व्यास = १२.७ cm
आन्तरिक उँचाई = २७.९ - २८.२ cm

हॉपर B
शिखर का व्यास = २२.९ cm
तली का आ० व्यास = १२.७ cm
आन्तरिक उँचाई = २२.७ cm

हॉपर C
आन्तरिक व्यास = १५.२ cm
" " उँचाई = ३०.३ cm

Compacting factor test

विधि ⇒ कंक्रीट बनाने के पश्चात उपकरण की सफाई कर हॉपरो व सिलण्डर में तेल या ग्रीस लगा कर हॉपरों के सपाट बन्द कर दिये जाते है। तथा सिलण्डर के शीशर के ढक दिया जाता है तथा कंक्रीट ऊपरी हॉपर में भर दी जाती है। तथा भरते समय कंक्रीट पर पाव न लगने न पाये तथा इसके तली का कपाट हटा दिया जाता है। जिस से कंक्रीट निचले हॉपर में भर जाये यह हॉपर ऊपरी हॉपर से छोटा होने के कारण तथा इसके कंक्रीट अच्छी प्रकार से भर जाती है। तथा सिलण्डर के शीशर से ढक्कन हटाकर निचले हॉपर का द्वार खोल दिया जाता है। तथा कंक्रीट सिलण्डर मे भर जाती है। सिलण्डर से अति कंक्रीट फ्लोट अथवा छड़ से हटाकर सतह समतल कर दी जाती है। तथा सिलेण्डर को तोल का इसका भार एवं ज्ञात कर कंक्रीट का घनत्व ज्ञात कर लिया जाता है।

इसके पश्चात सिलेण्डर की कंक्रीट का हाथ अथवा कम्पित से सहनन कर पूर्णतः भरे सिलेण्डर का भर ज्ञात कर पूर्णतः कुटाई की गई कंक्रीट का घनत्व ज्ञात कर लिया जाता है। पूर्णतः कुटाई वाली कंक्रीट का भार सैद्धान्तिक रूप से भी ज्ञात किया जा सकता है। इन दोनों घनत्वों का अनुपात ज्ञात कर कोम्पेक्टिंग फैक्टर ज्ञात कर लिया जाता है। सिलण्डर का आयतन समान होने के कारण कोम्पक्टिंग फैक्टर कंक्रीट के असंहनन भार व संहनन भार का अनुपात होगा

Class Test II GPC Jodhpur MM 15

CE 203 Building Technology TIME 1 HR

Attempt any three

1. Explain general principles for construction of stone masonry (पत्थर की चिनाई).
2. Explain different type of scaffolding (मचान) and shores (टेकबंदी)with their uses.
3. Explain causes of dampness (सीलन) and its prevention (रोकथाम के उपाय)
4. Explain types of arch(मेहराब) and lintels(सरदल)

Class Test II GPC Jodhpur MM 15

CE 209 COSTRUCTION MATERIALS AND EQUIPMENTS TIME 1 HR

Attempt any three

1. Explain Manufacturing process of ordinary Portland cement.
   (ओपीसी की निर्माण पद्वती समझाइए)
2. What is seasoning of timber and explain its 3 methods.
   (प्रकाष्ट के संसोषन की 3 विधिया बताइये)
3. Explain cast iron (ढलवा लोहा), wrought iron (पिटवा लोहा) and steel (इस्पात)
4. Explain galvanization (गेलविनिकरण) and methods for prevention of corrosion. (संक्षारण)

II_{nd} CLASS TEST BUILDING TECHNOLOGY CODE 203

Solution Q. No. 1

General principles for construction of stone masonry

1. The stones to be used for stone masonry should be hard, tough and durable. The pressure acting on stones should be vertical. The stones should be perfectly dressed as per the requirements. The heads and bond stones should not be of a dumb bell shape. In order to obtain uniform distribution of load, under the ends of girders, roof trusses etc large flat stones should be used.

2. The mortar to be used should be good quality and in the specified faces. The construction work of stone masonry should be raised uniformly. The plumb bob should be used to check the verticality of erected wall. The stone masonry section should always be designed to take compression and not the tensile stresses. The masonry work should be properly cured after the completion of work, for a period of 2 to 3 weeks.

3. As far as possible broken stones or small stones chips should not be used. Double scaffolding should be used for working at higher level. The masonry hearting should be properly packed with mortar and chips if necessary to avoid hallows. The properly wetted stones should be used to avoid mortar moisture being sucked.

Solution Q. No. 2

a) Scaffolding

Scaffolding is a temporary rigid structure made of still, bamboo or timber. The primary aim of constructing a scaffold is to create a platform on which mason can work at different heights. Scaffolds also help to lift materials for the immediate uses at different heights.

Following are types of Scaffolding in construction:

1. Single scaffolding.
2. Double scaffolding.
3. Cantilever scaffolding.
4. Suspended scaffolding.
5. Trestle scaffolding.
6. Steel scaffolding.
7. Patented scaffolding.

b) Shoring

Shoring is the process of temporarily supporting a building, vessel, structure, or trench with shores (props) when in danger of collapse or during repairs or alterations. Shoring comes from shore a timber or metal prop.

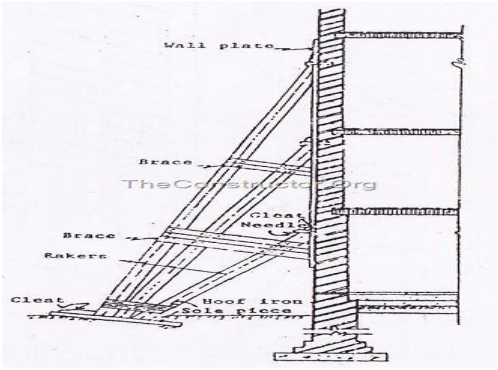
Types of shoring

1. Raking shores
2. Flying shores
3. Dead shores

RAKING SHORES

In this method, inclined members known as rakers are used to give lateral supports to walls. A raking shore consists of the following components:

Rakers or inclined member, Wall plate, Needles, Cleats, Bracing and Sole plate



Solution Q. No. 3

DAMPNESS

Structural dampness is the presence of unwanted moisture in the structure of a building, either the result of intrusion from outside or condensation from within the structure. A high proportion of damp problems in buildings are caused by condensation, rain penetration or rising damp.

Causes of dampness in buildings

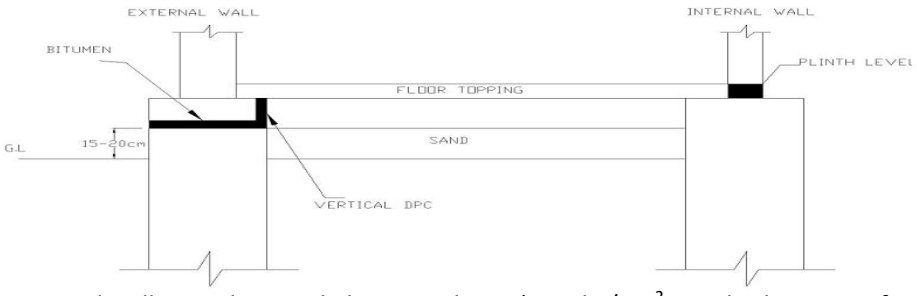
- Rain penetration
- Level of site
- Drain ability of soil
- climate condition
- Defective orientation of building
- Moisture entrapped during construction
- Defective construction e.g. joints

Method of preventing dampness

- By providing DPC (Damp proof course)
- By surface treatment i.e. by providing damp proof paint
- By integral water proofing method
- By special devices i.e. by providing chajjas & by providing cavity walls et

DPC - Damp proof course

It is continuous layer of impervious material applied to prevent moisture transmission. A common example is polyethylene sheeting laid under a concrete slab to prevent the concrete from gaining moisture through capillary action. A DPM may be used for the DPC. Rising damp is caused by capillary action drawing moisture up through the porous elements of a building's fabric. Rising damp, and some penetrating damp, can be caused by faults to, or the absence of a damp-proof course (DPC) or damp-proof membrane (DPM).



- For internal wall we only provide horizontal DPC (175 kg/cm^2 standard pressure for bitumen)
- Three layers of bitumen is provided
- You should provide a mortar layer before DPC

Solution Q. No 4

a) ARCHES

There are many shapes of arches. These are mainly characterized by the curve of the intrados and the ratio of height to span. Most arches are connected to the wall by the extrados. The corbel arch, built using courses gradually jutting further out, and monolithic arches, whether poured, tamped or cut out, have no extrados and continue directly on from the wall. The main function of an arch is to bridge an opening in a wall. By juxtaposing and repeating arches resting on pillars, one can obtain arcades, which allow one to create very open covered spaces. Arcature, or blind arches can be used to lighten the masonry structure or simply for decorative purposes.

Types of Arches

Arches are classified based on Shape, Workmanship and Materials of construction

Types of Arches based on shape:

Based on the shape of construction arches are classified into 10 types and they are discussed below.

- Flat Arch
- Segmental Arch
- Semi-Circular Arch
- Horse Shoe Arch
- Pointed Arch
- Venetian Arch
- Florentine Arch
- Relieving Arch
- Stilted Arch
- Semi-Elliptical Arch

Types of Arches based on Workmanship and Construction Materials

Based on material used for construction and workmanship, arches may be classified as:

1. Stone Arches: Based on workmanship, these are sub divided into two types. They are,
    - Rubble arches
    - Ashlar Arches
2. Brick Arches : Brick arches are also subdivided into:
    - Rough brick arches
    - Axed brick arches
    - Gauged brick arches
    - Purpose made brick arches
3. Concrete Arches: Concrete arches are of two types:
    - Precast concrete block arches
    - Monolithic concrete block arches

b) LINTEL

A lintel is a horizontal member which is placed across the openings like doors, windows etc. in buildings. A lintel take the load from the structure above it and provides support. Lintel is also a type beam, the width of which is equal to the width of wall, and the ends of which are built into the wall. These are very easy to construct as compared to arches.

Types of Lintels used in Building Construction

Lintels are classified based on the material of construction as:

- Timber lintel
- Stone lintel
- Brick lintel
- Steel lintel
- Reinforced concrete lintel
- Reinforced brick lintel
- Timber Lintels

II_{ND} CLASS TEST CONSTRUCTION MATERIALS AND EQUIPMENTS CODE 209

Solution Q. No 1

Ordinary Portland Cement Manufacturing:

Cement can be defined as the bonding material having cohesive & adhesive properties which makes it capable to unite the different construction materials and form the compacted assembly. Ordinary/Normal Portland cement is one of the most widely used type of Portland Cement.

Raw Materials used for OPC

- Calcareous (material having content of lime)
- Argillaceous (material having contents of silica & alumina)
- Gypsum

Process

Cement is usually manufactured by two processes:

- Wet process
- Dry process

These two processes differ in operation but fundamentals of both these processes are same. In India, most of the factories use Wet Process for the production of cement. There are five stages in manufacturing of cement by wet process:

Crushing and Grinding: In this phase, soft raw materials are first crushed into suitable size. This is done usually in cylindrical ball or tube mills containing the charge of steel balls

Mixing the Material: In this part, the powdered limestone is mixed with the clay paste in proper proportion (75%=lime stone; clay=25%). The mixture is then grounded and made homogeneous by mean of compressed gas. The resulting material is known as slurry having 35-40% water.

Heating the slurry in rotary kiln: Slurry is then introduced in rotary kiln with help of conveyor. The rotary kiln consists of large cylinders 8 to 15 feet in diameter & height of 300-500 feet. It is made with steel & is usually lined inside with firebricks.

Rotary Kiln: Kiln rotates at the rate of 1-2 revolution per minute. In rotary kiln, slurry is passed through different zones of temperature. This whole process in kiln usually covers 2 to 3 hours. Different temperature zones are as under:

Preheating Zone: In this zone, temperature is kept at 500 degree Celsius & usually the moisture is removed & clay is broken into silica, aluminum oxide, iron oxide.

Decomposition Zone: Temperature is raised up to 800 degree Celsius. In this zone lime stone decomposes into lime and CO2.

Burning Zone: In this zone temperature is maintained up to 1500 degree Celsius and the oxides formed in above zones combine together and form respective silicate, aluminates & ferrite.

Cooling Zone: This is last stage where the whole assembly cooled is up to 150 to 200 degree Celsius.

Clinker Formation: The product which is obtained from the rotary kiln is known as the cement Clinker. Clinker is usually in the form of greenish black or grey colored balls.

Grinding the Clinker with Gypsum: The Cement Clinker is then air cooled. The required amount of Gypsum (5 %) is ground to the fine powder, and then mixed with the Clinker. Finally cement is packed in bags and then transported to the required site.

Solution Q. No 2

SEASONING OF TIMBER

Seasoning of timber is the process by which moisture content in the timber is reduced to required level. By reducing moisture content, the strength, elasticity and durability properties are developed. A well-seasoned timber has 15% moisture content in it.

Methods of Seasoning of Timber

There are two methods of Seasoning of timber which are explained below

- Natural seasoning
- Artificial seasoning

***Natural Seasoning of Timber**:* Natural seasoning is the process in which timber is seasoned by subjecting it to the natural elements such as air or water. Natural seasoning may be water seasoning or air seasoning.

Water Seasoning: Water seasoning is the process in which timber is immersed in water flow which helps to remove the sap present in the timber. It will take 2 to 4 weeks of time and after that the timber is allowed to dry. Well-seasoned timber is ready to use.

Air Seasoning: In the process of air seasoning timber logs are arranged in layers in a shed. The arrangement is done by maintaining some gap with the ground. So, platform is built on ground at 300mm height from ground. The logs are arranged in such a way that air is circulated freely between logs. By the movement of air, the moisture content in timber slowly reduces and seasoning occurs. Even though it is a slow process it will produce well-seasoned timber. Air Seasoning of Timber

Artificial Seasoning of Timber: Natural seasoning gives good results but takes more time. So, artificial seasoning of timber is developed nowadays. By artificial seasoning, timber is seasoned with in 4-5 days. Here also different methods of artificial seasoning are there and they are as follows.

- Seasoning by Boiling
- Chemical seasoning
- Kiln seasoning
- Electrical seasoning

Seasoning by Boiling: Seasoning of timber is also achieved by boiling it in water for 3 to 4 hours. After boiling timber is allowed to drying. For large quantity of timber boiling is difficult so, sometimes hot steam is passed through timber logs in enclosed room. It also gives good results. The boiling or steaming process develops the strength and elasticity of timber but economically it is of heavier cost.

Chemical Seasoning: In case of chemical seasoning, timber is stored in suitable salt solution for some time. The salt solution used has the tendency to absorb water from the timber. So, the moisture content is removed and then timber is allowed to drying. It affects the strength of the timber.

Kiln Seasoning: In this method timber is subjected to hot air in air tight chamber. The hot air circulates in between the timber logs and reduces the moisture content. The temperature inside the chamber is raised with the help of heating coils. When the required temperature is obtained moisture content and relative humidity gets reduced and timber gets seasoned. Even though it is costly process it will give good results strength wise. Kiln Seasoning of Timber

Electrical Seasoning: In the method of electrical seasoning timber is subjected to high frequency alternating currents. The resistance of timber against electricity is measured at every interval of time. Electrical Seasoning of Timber When the required resistance is reached seasoning, process is stopped because resistance of timber increases by reducing moisture content in it. It is also called as rapid seasoning and it is uneconomical.

Solution Q. No 3

a) CAST IRON

Cast iron, an alloy of iron that contains 2 to 4 percent carbon, along with varying amounts of silicon and manganese and traces of impurities such as sulphur and phosphorus. It is made by reducing iron ore in a blast furnace. The liquid iron is cast, or poured and hardened, into crude ingots called pigs, and the pigs are subsequently remelted along with scrap and alloying elements in cupola furnaces and recast into molds for producing a variety of products.

Types of cast iron

Cast irons can be divided into five groups, based on composition and metallurgical structure:

- Gray cast iron,
- Ductile cast iron,
- White cast iron,
- Malleable cast iron,
- Compacted graphite iron and,
- Alloy cast iron.

b) WROUGHT IRON

Wrought iron, one of the two forms in which iron is obtained by smelting; the other is cast iron (q.v.). Wrought iron is a soft, ductile, fibrous variety that is produced from a semifused mass of relatively pure iron globules partially surrounded by slag. It usually contains less than 0.1 percent carbon and 1 or 2 percent slag. It is superior for most purposes to cast iron, which is overly hard and brittle owing to its high carbon content. Dating back to antiquity, the first iron was smelted directly from iron ore by heating the latter in a forge with charcoal, which served both as a fuel and a reducing agent. While still hot, the reduced iron and slag mixture was then removed as a lump and worked (wrought) with a hammer to expel most of the slag and weld the iron into a coherent mass.

Types of wrought iron

There are two types of wrought iron

Charcoal Iron: Made in a charcoal fire and used from the Iron Age to the end of the eighteenth century.

Puddled Iron: Made from cast iron in an indirect coal fired furnace and used since the dawn of the modern industrial era.

c) STEEL

Steel is what is known as an alloy, meaning it is not naturally found but instead is man-made, composed from a combination of different materials and metals. The type of steel achieved at the end of the steel making process depends upon both the different types of metals that have been melted together to form the final product and how these metals are heated, cooled and handled during production. The different types of steels range in price and are appropriate for different types of projects, such as whether the steel is used in building homes or making tools. Stainless steel is among the cheapest metals to produce. One of the reasons stainless steel has become so popular in construction projects is the fact that it does not rust or break down when exposed to moisture, for this reason, stainless steel is also known as corrosion resistant steel. Unlike other common forms of steel, stainless steel is made from chromium as opposed to carbon, which forms a protective layer over the inner layers of steel and provides stainless steel that non-corrosive power.

Type of steel

- Stainless Steel
- Cobalt Steel

- Carbon Steel
- Carbide Steel
- High-speed Steel

Solution Q. No 4

a) GALVANIZATION

Galvanizing is one of the most widely used to methods for protecting metal from corrosion. It involves applying a thin coating of zinc to a thicker base metal, helping to shield it from the surrounding environment. The next time you are in your car, take a look at the street signs and lamp posts you pass. A large number of them will have a mute, silver color on them. That "silver" is actually the coating of zinc.

Importance of Galvanization: Galvanizing a metal gives it anti-corrosion properties. Without the protective zinc coating, the metal would remain exposed to the elements and potentially oxidize and corrode much faster. Galvanized Steel is a cost effective alternative to using materials such as austenitic stainless steel or aluminum in order to prevent corrosion. Galvanizing can protect metal is a number of ways. Firstly, it creates a protective coating that shields the metal from the surrounding environment. The layer of zinc prevents water and moisture and other elements in the air from corroding the steel underneath. Should the zinc coating be scratched deep enough, the metal would become exposed and susceptible to corrosion.

Different Methods of Galvanizing: There are several different processes for galvanizing metal:

- Hot-Dip Galvanizing
- Pre-galvanizing
- Electrogalvanizing

b) CORROSION

Corrosion is a deterioration of a material caused by environmental interactions. It is a natural phenomenon, requiring three conditions: moisture, a metallic surface, and an oxidizing agent known as an electron acceptor. The process of corrosion converts the reactive metal surface into a more stable form, namely its oxide, hydroxide, or sulfide. A common form of corrosion is rust.

Method for Prevent Corrosion

Metal Type: One simple way to prevent corrosion is to use a corrosion resistant metal such as aluminum or stainless steel. Depending on the application, these metals can be used to reduce the need for additional corrosion protection.

Protective Coatings: The application of a paint coating is a cost-effective way of preventing corrosion. Paint coatings act as a barrier to prevent the transfer of electrochemical charge from the corrosive solution to the metal underneath. Another possibility is applying a powder coating. In this process, a dry powder is applied to the clean metal surface. The metal is then heated which fuses the powder into a smooth unbroken film. A number of different powder compositions can be used, including acrylic, polyester, epoxy, nylon, and urethane.

Environmental Measures: Corrosion is caused by a chemical reaction between the metal and gases in the surrounding environment. By taking measures to control the environment, these unwanted reactions can be minimized. This can be as simple as reducing exposure to rain or seawater, or more complex measures, such as controlling the amounts of sulfur, chlorine, or oxygen in the surrounding environment. An example of this would be would be treating the water in water boilers with softeners to adjust hardness, alkalinity, or oxygen content.