I - MID TERM PAPER ANSWER SHEET

JNIT

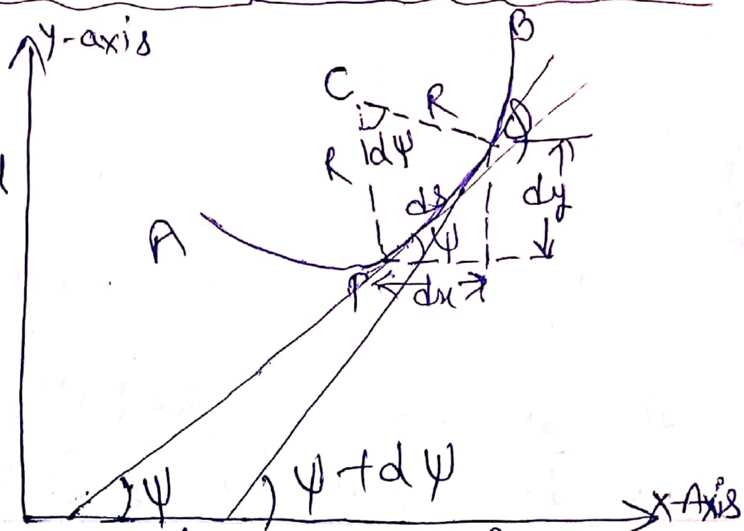
JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY JAIPUR

I / II -MID TERM PAPER ANSWER SHEET

Semester: IVth Sem
Branch : CIVIL ENGG.
Subject : SOM - II (4CE1A)
Submitted by : PAWAN KUMAR SUTHAR

Ans (1) Relation between Slope, deflection & Radius of curvature

Let the curve AB represents the deflection of Beam as shown in fig. Consider a small portion PQ of the Beam. Let the tangents at P & Q make angle ψ & $\psi + d\psi$ with x-axis. The Normal at P & Q will meet at C such that PC = QC = R



The point C is known as centre of curvature of the curve PQ.

Let length PQ = ds $\quad \because \angle PCQ = d\psi$

$\therefore PQ = ds = R\,d\psi \Rightarrow \boxed{R = ds/d\psi}$ — (1)

In ΔPQS, $\tan\psi = \frac{dy}{dx}$, $\sin\psi = dy/ds$ & $\cos\psi = dx/ds$

So, $\boxed{\tan\psi = dy/dx}$ — (2)

Now Eq^n (1) can be written as $R = \frac{ds}{d\psi} = \frac{ds/dx}{d\psi/dx} = \frac{\frac{1}{\cos\psi}}{d\psi/dx}$

$$\Rightarrow \boxed{R = \frac{\sec\psi}{d\psi/dx}} \quad \text{— (3)}$$

Now differentiating the Eq^n (2) with respect to "x".

$\sec^2\psi \, \frac{d\psi}{dx} = \frac{d^2y}{dx^2} \Rightarrow d\psi/dx = \frac{d^2y/dx^2}{\sec^2\psi}$

Now value of $\frac{d\psi}{dx}$, put in Eq^n (3) we get,

$$R = \frac{\sec\psi}{\frac{d^2y/dx^2}{\sec^2\psi}} = \frac{\sec^3\psi}{d^2y/dx^2} \Rightarrow \frac{1}{R} = \frac{d^2y/dx^2}{\sec^3\psi}$$

$$\Rightarrow \frac{1}{R} = \frac{d^2y/dx^2}{(\sec^2\psi)^{3/2}} = \frac{d^2y/dx^2}{(1+\tan^2\psi)^{3/2}} \quad \{\because \sec^2\psi = 1+\tan^2\psi\}$$

Because ψ is very small, than $\tan\psi \simeq 0$

$$\Rightarrow \frac{1}{R} = d^2y/dx^2$$

we know that flexture formula $\frac{M}{I} = \frac{E}{R}$

$$\Rightarrow \frac{M}{EI} = \frac{1}{R} = d^2y/dx^2$$

$$\Rightarrow \boxed{M = EI\frac{d^2y}{dx^2}}$$

Ans ⇒

Ans ② Suitability of various methods for finding the Slope & deflection of Beams :

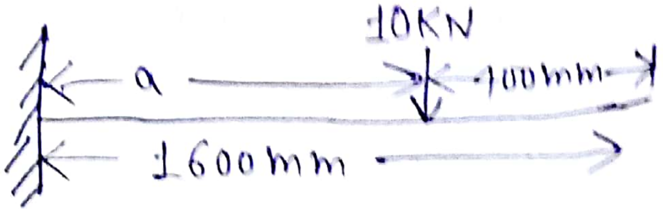
(A) Double Integration Method :→ In the process of double integration two constants of integration C_1 & C_2 will be obtained, the values of which can be determined by the using conditions at the two ends of the beam.

(B) Macauley's Method :→ This is a convenient method for determining the deflections of a Beam subjected to point loads or in general discontinuous loads. This method mainly consists in the special manner in which the B.M. at any section is expressed & in the manner in which the integration is carried out.

(C) Area moment Method :→ It is also known as moment area method. It is a very useful & simple method for finding slopes & deflections of the Beams. The method utilizes the properties of the area of the ~~beams~~ B.M.D. & also the moment of that Area. This method is especially suited for Cantilever Beams.

(D) Conjugate Beam Method :→ All the methods explained above are suitable only for simple cases, where the Beam is having uniform flexural rigidity. If however, the flexural rigidity EI is not uniform the method of conjugate Beam method is quite suitable.

Ans (3)



Given data

$W = 10KN = 10 \times 10^3 N$

$L = 1600mm$

$b = 400mm$, $E = 70GPa = 70 \times 10^3 N/mm^2$, $I = 85 \times 10^4 mm^4$

$a = 1600 - 400 = 1200mm$

Slope (θ_{max}) at free End $= \frac{Wa^2}{2EI} = \frac{10 \times 10^3 \times (1200)^2}{2 \times 70 \times 10^3 \times 85 \times 10^4}$

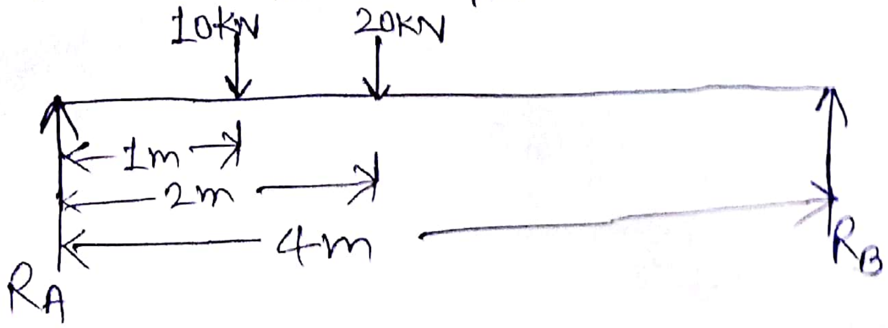
$\theta_{max} = 0.121$ rad.

Deflection at free End (y_{max}) $= \frac{Wa^2}{2EI}\left(L - \frac{a}{3}\right)$

$y_{max} = \frac{10 \times 10^3 \times (1200)^2}{2 \times 70 \times 10^3 \times 85 \times 10^4}\left(1600 - \frac{1200}{3}\right) = 145.21 mm$

Ans (4) Given $E = 2 \times 10^5 N/mm^2$, $b = 200mm$, $d = 400mm$

So, $I = \frac{bd^3}{12} = \frac{200 \times 400^3}{12} = 1.066 \times 10^9 mm^4$



value of R_A & R_B :-

$R_A + R_B = 10 + 20 = 30KN$

take moment about A point,

$R_B \times 4 = 10 \times 1 + 20 \times 2 = 50$ $\Rightarrow$ $R_B = 12.5 KN$

& $R_A = 30 - 12.5 = 17.5 KN$

Consider the section x-x in the last part of the Beam at a distance x from the left support A. The B.M. at this section is given by

$M_x = R_A x - 10(x-1) - 20(x-2)$

So, $EI\frac{d^2y}{dx^2} = R_A x \,\vdots\, -10(x-1) \,\vdots\, -20(x-2)$

$= 17.5x \,\vdots\, -10(x-1) \,\vdots\, -20(x-2)$

Integrating the above Eqn w.r.to "x",

$$EI\frac{dy}{dx} = 8.75x^2 + C_1 \,\vdots\, -5(x-1)^2 \,\vdots\, -10(x-2)^2 \quad \text{—(1)}$$

Again Integrating,

$$EIy = 2.91x^3 + C_1 x + C_2 \,\vdots\, -1.67(x-1)^3 \,\vdots\, -3.3(x-2)^3 \quad \text{—(2)}$$

Now value of C_1 & C_2

(i) At $x=0, y=0$ (ii) $x=4, y=0$

Substituting the boundary conditions in Eqn (1) & (2)

we get $C_1 = -28.68$ & $C_2 = 0$

(A) Deflection under Ist load i.e. at point C

Using Eqn (2) (put $x = 1m$) vaild upto Ist dotted line

$$EIy_c = 2.91(1)^3 - 28.68 \times 1 + 0$$

$$= -25.77 \text{ KN-m}^3 = -25.77 \times 10^{12} \text{ N-mm}^3$$

$$y_c = \frac{-25.77 \times 10^{12}}{2 \times 10^5 \times 1.067 \times 10^9} = -0.120 \text{ mm}$$

(B) Deflection under IInd load i.e. at point D

Using Eqn (2) (put $x = 2m$) vaild upto IInd dotted line

$$EIy_D = 2.91 \times 2^3 - 28.68 \times 2 + 0 - 1.677(2-1)^3$$

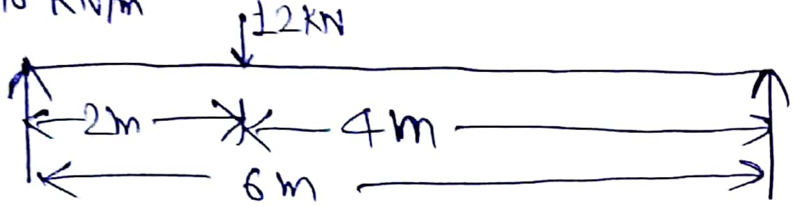
$$EIy_D = -35.75 \text{ KN-m}^3 = -35.75 \times 10^{12} \text{ N-mm}^3$$

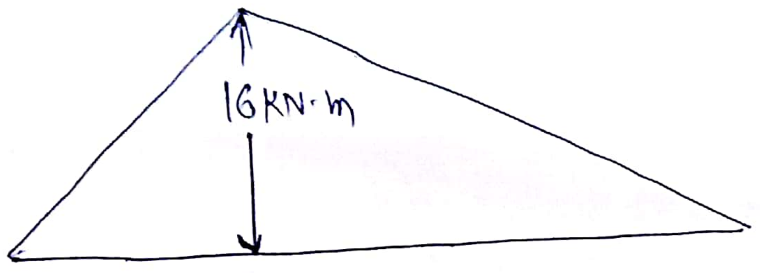
$$y_D = \frac{-35.75 \times 10^{12}}{2 \times 10^5 \times 1.067 \times 10^9} = -0.16 \text{ mm}$$

Ans 5) Given $L = 6m$, $W = 12KN$, $a = 2m$, $b = 4m$

$E = 2\times10^5\ N/mm^2$, $I = 1\times10^8\ mm^4 = 10^{-4}\ m^4$

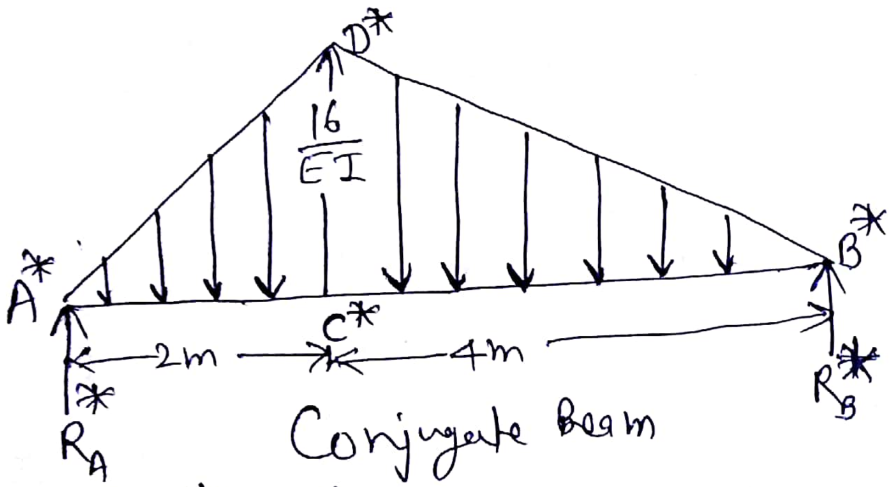
$E = 2\times10^8\ KN/m^2$





B.M.D.

$$B.M.D = \frac{Wab}{L} = \frac{12\times2\times4}{6} = 16\ KN\cdot m$$



Conjugate Beam

$$R_A^* + R_B^* = \frac{1}{2}\times6\times\frac{16}{EI} = \frac{48}{EI}$$

Value of R_A^* & R_B^*

Taking moments about A^*, we get

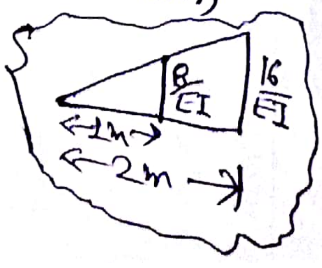
$$R_B^*\times6 = \left(\frac{1}{2}\times2\times\frac{16}{EI}\right)\left(\frac{2}{3}\times2\right) + \left(\frac{1}{2}\times4\times\frac{16}{EI}\right)\left(2+\frac{1}{3}\times4\right)$$

$$\boxed{R_B^* = \frac{64}{3EI}} \quad \& \quad \boxed{R_A^* = \frac{80}{3EI}}$$

Deflection at 1m from left End

y_1 = B.M. at 1m from left End for Conjugate Beam

$$= \frac{80}{3EI}\times1 - \left(\frac{1}{2}\times1\times\frac{8}{EI}\right)\times\left(\frac{1}{3}\times1\right)$$



put value of E & I, we get

$$\boxed{y_1 = 0.0012\ mm}$$

Subject - CT(4CE2A)

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JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY JAIPUR
I / II -MID TERM PAPER ANSWER SHEET

Semester: 4th. Branch : Civil Engineering

Subject : CT Submitted by : Mukesh Chaudhary.

Ist MID TERM

Q:1 Discuss role of water-cement ratio

Ans: The three simple ingredients can be blended and proportioned numerous ways to make concrete:

1) Aggregate.

2) Cement

3) Water

In concrete, the single most significant influence on most or all of the properties is the amount of water used in the mix. In concrete mix design, the ratio of the amount of water to the amount of ~~water~~ cement used (both by weight) is called the "water to cement ratio (w/c)". These two ingredients are responsible for binding everything together. The water to cement ratio largely determines the strength and durability of the concrete when it is cured properly. The w/c ratio refers to the ratio of the weights of water and cement used in the concrete mix. A w/c ratio of 0.4 means that for every 100 kg of cement used in the concrete, 40 kg of water is added.

Typical w/c ratios are as follows:

- Normal for ordinary concrete (sidewalks and driveways): 0.6 to 0.7.

- Specified if a higher quality concrete is desired: 0.4
  The practical range of the w/c ratio is from about 0.3 to 0.8

- A ratio of 0.3 is very stiff (unless superplasticizers are used).

- A ratio of 0.8 makes a wet and fairly weak concrete.
  Typical compressive strengths when concrete is properly curved are:

- 0.4 w/c ratio → 5600 psi (1 psi = 6894.75729 N/m²)
- 0.8 w/c ratio → 2000 psi (1 psi = 6894.75729 N/m²)

The simplest way to ~~think~~ think about the w/c ratio is to think that the greater the amount of water in a concrete mix, the more the cement paste will be diluted. This not only affects the compressive strength, it also affects the tensile and flexural strengths, the porosity, the shrinkage and the colour.. The strength is reduced mostly because adding more water creates a diluted paste that is weaker. More water results in larger spacing of the cement particles.

Q2: Discuss compaction factor test for concrete.

Ans: The compacting factor test is designed primarily for use in the laboratory but it can also be used in the field. It is more precise and sensitive than the slump test and it is particularly useful for concrete mixes of very low workability as are normally used when concrete is to be compacted by vibration. Such dry concrete are insensitive to slump test. The essential dimensions of the hoppers and mould and the distance between them. ~~are shown~~ It is the most ~~effective~~ efficient tests for measuring the workability of concrete. This tests work on the principle of determining the degree of compaction achieved by a standard amount of workdone by allowing the concrete to fall through a standard height. The degree of compaction, called the ~~ratio~~ compacting factor is measured by the density ratio, ie, the ratio of density actually achieved in the test to density of same concrete fully compacted

As the crystals grow, they are too far apart to knit together and form strong bonds. Concrete with a higher w/c ratio is also more susceptible to craking and shrinkage. Shrinkage leads to micro-cracks, which are zones of weakness. Once the fresh concrete is placed, excess water is squeezed out of the paste by the weight of the aggregate and the cement paste itself. When there is a large excess of water, that water bleeds out onto the surface. The micro channels and passages that were created inside the concrete to allow the water to flow, become weak zones and micro cracks.

Using a low w/c ratio is the usual way to achieve a high strength and high quality concrete, but it does not guarantee that the resulting concrete is always appropriate for concrete countertops. Unless the aggregate gradation and proportion are balanced with correct amount of cement paste, excessive shrinkage, cracking and curling can results. Good concrete results from good mix design and low w/c ratio just one part of a good mix design.

Q3: Discuss various methods of transportation of concrete and their suitability.

Ans:

1. MORTAR PAN

It is a labour intensive method and generally used for small works. There are no chances of segregation of concrete.

2. WHEEL. BARROW OR HAND CART

It is normally used on ground level i.e. road construction and other similar structures.

3. BUCKET AND ROPEWAY

It is suitable for works in valley, over high piers and long dam sites.

4. TRUCK MIXER AND DUMPER

It is an improved and better method for long lead concreting. For long distance is involved, agitators should be used.

5. BELT CONVAYOR

It has limited application due to chances of segregation on steep slopes, roller points and changes in direction of belt.

6. CHUTE

It is generally used ~~for~~ for concreting in deep locations. Technically it is not a very good method but it is extensively used in the field.

7. SKIP AND HOIST

It is a widely used method for high rise structures. Concrete is fed into the skip which travels vertically on rails like a lift.

8. PUMP AND PIPE-LINE METHOD

It is the most sophisticated method particularly suitable for limited space or when a large quantity of concrete is to be poured without cold joints.

9. TRANSIT MIXER

It is one of the most popular equipment for transporting concrete over a long distance particularly in ready mix concrete plant.

Q4: Discuss various types of vibrators and their use on compaction of concrete.

1) Internal vibrator: ~~One~~ Of all the vibrators, the internal vibrators are most commonly used. ~~It~~ is ~~compactio~~ also called, 'Needle vibrator', 'Immersion vibrator' or 'Poker vibrator'.

2) Formwork vibrator (External vibrator): They are used for concreting columns, thin walls or in the casting of precast units. The machine is clamped onto the external wall surface of the framework.

3) Table vibrator: This is a special formwork vibrator, where the vibrator is clamped to the table or table is mounted ~~on~~ in springs which are vibrated transferring the vibration to the table.

4) Platform vibrator: Platform vibrator is nothing but a table vibrator, but it is larger in size. This is used for vibrating concrete ~~cubes~~ elements. Any article kept on table gets vibrated.

5) Surface vibrator: It is sometimes known as "Screed Board Vibrators". A small vibrator placed on the screed board gives an effective method of compacting and levelling of thin concrete members such as floor ~~tiles~~ slabs, roof slabs and road surface.

6) Compaction by spinning: Spinning is one of the recent methods of compaction of concrete.

This method of compaction is adopted for the fabrication of concrete pipes. The plastic concrete when spun at a very high speed gets well compacted by centrifugal force. Patented products such as "Humes pipes", "Spun Pipes" are compacted by spinning process.

Q:5 Design a M-40 Concrete mix with maximum size of aggregate 20 mm, using IS Code method. Make necessary assumptions and state them.

Solⁿ:- Mix design M-40 Grade

→ Parameter for mix design M-40
→ Grade Designation = M-40
→ Type of Cement = O.P.C. 43 grade
→ Admixture = fosroc (Conplast SP430 G8M)
→ Fine Aggregate = Zone-II
• Sp. Gravity of Cement = 3.15
Fine Aggregate = 2.61
Coarse Aggregate (20mm) = 2.65
Coarse Aggregate (10mm) = 2.66
→ Min Cement (As Per Contract) = 400 Kg/m³
→ Max Water Cement Ratio (As per Contract) = 0.45

•• Mix Calculation:

1. Target mean strength

$f_c = f_{ck} + K \times S$ (1.65) (σ) (5)

f_c = Target mean Compressive strength at 28 days

f_{ck} = Characteristic Compressive strength at 28 days.

S = Standard devation ~~(1.65)~~ (5)

K = A statistical value, depending upon the accepted proportion of low test results and No. of tests. ~~(5)~~ (1.65)

$f_c = 40 + 1.65 \times 5$

$\boxed{f_c = 48.25 \text{ Mpa}}$

2. Selection of Water Cement Ratio:
Assume Water cement Ratio = 0.4

3. Calculation of Cement Content:
Assume Cement Content 400 Kg/m³
(As Per Contract min cement Content 400 Kg/m³)

4. Calculation of water

$400 \times 0.4 = 160$ kg which is less than 186 kg (As Per Table No. 4, IS:10262) Hence o.k.

5. Calculation of C.A. & F.A. : As Per IS 10262, Cl. No 3.5.1

$$V = [W + (C/S_c) + (1/p) \cdot (f_a/S_{fa})] \times (1/1000)$$

$$V = [W + (C/S_c) + \{1/(1-p)\} \cdot (C_a/S_{ca})] \times (1/1000)$$

where

V = Absolute Volume of fresh Concrete, which is equal to gross Volume (m^3) minus the Volume of entrapped air

W = mass of Water (kg) Per m^3 of Concrete

C = Mass of Cement (kg) Per m^3 of Concrete.

S_c = Specific gravity of Cement

p = Ratio of fine Aggregate to the total Aggregate by absolute Volume

(f_a), (C_a) = Total mass of fine Aggregate and Coarse Aggregate (kg) Per m^3 of Concrete respectively

S_{fa}, S_{ca} = Sp. gravities of Saturated Surface dry fine Aggregate and Coarse Aggregates Respectively.

→ As Per Table No. 3 IS 10262, for 20mm maximum size entrapped air is 2 %.

Assume F.A. by % of Volume of total Aggregate = 36.5;

$$0.98 = [160 + (400/3.15) + (1/0.365)(f_a/2.61)](1/1000)$$

$f_a = 660.2$ kg

Say $f_a = 660$ kg

$$\Rightarrow .98 = [160 + (400/3.15) + (1/0.635)(Ca/2.655)](1/1000)$$

(3)

$\Rightarrow Ca = 1168.37$ kg.

Say Ca = 1168 Kg

→ Considering 20mm : 10mm = 0.6 : 0.4

20mm = 701 Kg.

10 mm = 467 Kg.

⇒ Hence mix details Per m^3

Cement = 400 kg.

Water = 160 Kg.

Fine Aggregate = 660 Kg.

Coarse Aggregate 20mm = 701 kg.

Coarse Aggregate 10mm = 467 Kg.

Admixture = 0.6 % by weight of cement = 2.4 Kg.

→ Water : Cement : F.A. : C.A.

$$\Rightarrow \frac{160}{400} : \frac{400}{400} : \frac{600}{400} : \frac{1160}{400} \Rightarrow 0.4 : 1 : 1.65 : 2.92$$

Observation:

A. Mix was Cohesive and homogeneous.

B. Slump = 110 mm

C. No of Cube Casted = 12 Nos.

7 days average Compressive strength = 51.26 MPa

28 days average Compressive strength = 61.90 MPa which is greater than 48.25 Mpa.

Hence, the mix is accepted.

Semester: IV
Subject : HHM
Branch : Civil
Submitted by : Himanshu Bhardwaj

Buckingham's π Theorem:-

If there are n varibles dependent and independent in a physical phenomeon and if these varibles contains m fundamental dimensions (MLT) then the variables are arranged into (m-n) dimensionless term.

$$\eta = f(\rho, \mu, \omega, D, Q)$$

$$= f_1(\eta, \rho, \mu, \omega, D, Q) = 0$$

$n = 6$

$m = 3$ $\quad n - m = 6 - 3$

$= 3$

η - Dimensionless

$\rho = M^1 L^{-3} T^0$

$\mu = M^1 L^{-1} T^{-1}$

$\omega = M^0 L^0 T^{-1}$

$D = M^0 L^1 T^0$

$Q = M^0 L^3 T^{-1}$

$$\pi_1 = D^{a_1} . w^{b_1} . \rho^{c_1} . \eta$$
$$\pi_2 = D^{a_2} . w^{b_2} . \rho^{c_2} . \mu$$
$$\pi_3 = D^{a_3} . w^{b_3} . \rho^{c_3} . Q$$

First π Term

$$M^0 L^0 T^0 = L^{a_1} . (T^{-1})^{b_1} . (M L^{-3})^{c_1} . M^0 L^0 T^0$$

$c_1 = 0$
$a_1 = 0$
$b_1 = 0$

$$\pi_1 = D^0 w^0 \rho^0 . \eta$$

$$\boxed{\pi_1 = \eta}$$

Second π Term

$$M^0 L^0 T^0 = L^{a_2} . (T^{-1})^{b_2} . (M L^{-3})^{c_2} . M L^{-1} T^{-1}$$

$$\pi_2 = D^{-2} w^{-1} \rho^{-1} \mu$$

$$\boxed{\pi_2 = \frac{\mu}{D^2 w \rho}}$$

Third π Term

$$M^0 L^0 T^0 = L^{a_3} . (T^{-1})^{b_3} (M L^{-3})^{c_3} . L^3 T^{-1}$$

$$\pi_3 = D^{-3} w^{-1} \rho^0 . Q = \frac{Q}{D^3 w}$$

$$\boxed{\eta = \phi \left[\frac{\mu}{D^2 w \rho} . \frac{Q}{D^3 w} \right]}$$

Q. 2 Explain the types of forces acting on a moving fluid. Also states the dimensionless numbers?

soln → on a moving fluid, 6 types of forces are acting as follows:-

(i) Inertia force (F_i):- It is equal to product of mass and acceleration.

$$F_i = m \times a$$

(ii) Viscous force (F_v):- It is equal to the product of shear stress (due to viscosity and surface area of the flow.

$$F_v = \tau \times A$$

(iii) Gravity force (F_g):- It is equal to product of mass and gravitational acceleration.

$$F_g = m \times g$$

(iv) Pressure force:- it is equal to the product of intencity of pressure to the area of flowing fluid.

$F_p = p \times A$

(v) Surface tension force (F_s) :- equal to the product of surface tension and length of surface of fluid.

$F_s = \sigma \times L.$

(vi) Elastic force (F_e) :- It is equal to the product of elastic stress and area of flowing fluid.

$F_e = K \times A$

Dimensionless no :- following are the important dimensionless no.

1. Reynold's number
2. Froude's no.
3. Euler's number
4. Weber's number
5. Mach's number.

1. Reynold's number :- it is defined as the ratio of inertia force of a flowing fluid and the viscous force of the fluid.

$$R_e = \frac{F_i}{F_v}$$

we know $F_i = m \times a$

$$= \rho \times V \times \frac{V}{T}$$

$$= \rho \times A V^2$$

& $F_v = \tau \times A$

$$= \left(\mu \frac{du}{dy}\right) \times A$$

$$= \mu \cdot \frac{V}{L} \times A$$

so $R_e = \frac{\rho A V^2 \times L}{\mu \times V \times A} = \frac{\rho V L}{\mu} = \frac{V \times L}{\nu}$

(ii) Froude Number (F_e) :- The it is defined as square root of the ratio of inetia force to the gravity force.

$$F_e = \sqrt{\frac{F_i}{F_g}} = \sqrt{\frac{\rho A V^2}{\rho A L g}} = \sqrt{\frac{V^2}{L g}} = \frac{V}{\sqrt{L g}}$$

$\because F_g = m \times g$

$$= \rho \times V \times g$$

$$= \rho \times A \times L \times g$$

(iii) Euler's number (E_u) → it is defined as the square root of the ratio of the inertia force of a flowing fluid to the pressure force.

$$E_u = \sqrt{\frac{F_i}{F_p}}$$

$$= \sqrt{\frac{\rho A V^2}{p \times A}} = \frac{V}{\sqrt{p/\rho}}$$

(iv) Weber's number (W_e) :- it is defined as the square root of the ratio of the inertia force of a flowing fluid to the surface tension force.

$$W_e = \sqrt{\frac{F_i}{F_s}} = \sqrt{\frac{\rho A V^2}{\sigma \times L}} = \frac{V}{\sqrt{\sigma/\rho L}}$$

(v) Mach's Number (M) :- it is defined as the square root of the ratio of the inertia force of flowing fluid to the elastic force.

$$M = \sqrt{\frac{F_i}{F_e}} = \sqrt{\frac{\rho A V^2}{K \times L^2}} = \frac{V}{\sqrt{K/\rho}}$$

$\because \sqrt{\frac{K}{\rho}} = C$ = Velocity of sound in fluid

Teacher's Signature

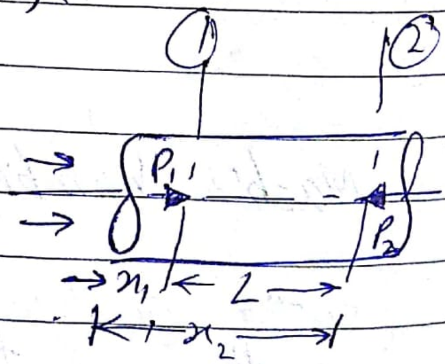
$\therefore \boxed{M = \frac{V}{C}}$

Q. 3. What is mean of viscous fluid. Derive the expression for pressure drop of viscous flow through circular pipes & plates?

sol^n -> Viscous fluids are defined as fluids which contain high viscosity and flow in in laminar flow at very low velocity

i Pressure drop in circular pipe :

we know $\bar{u} = \frac{1}{8\mu}\left(\frac{-\partial p}{\partial x}\right) R^2$



or $\frac{-\partial p}{\partial x} = \frac{8\mu\bar{u}}{R^2}$

intergrate w.r.t. 'x'

$$-\int_2^1 dP = \int_2^1 \frac{8\mu\bar{u}}{R^2} dx$$

$$-[P_1 - P_2] = \frac{8\mu\bar{u}}{R^2}[x_1 - x_2]$$

or $(P_1 - P_2) = \frac{8 \mu \bar{u}}{R^2} [x_2 - x_1]$

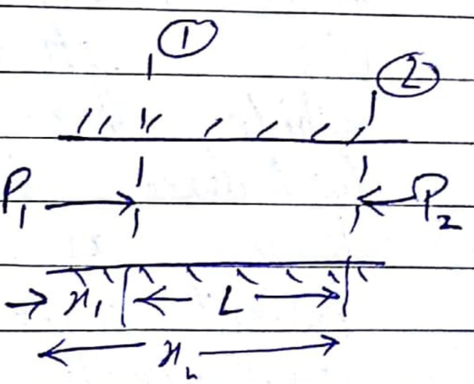
$= \frac{8 \mu \bar{u}}{R^2} L \qquad \because x_2 - x_1 = L$

$= \frac{8 \mu \bar{u} L}{(D/2)^2}$

$$\left[P_1 - P_2 = \frac{32 \mu \bar{u} L}{D} = \text{pressure drop.} \right] ☆$$

ii Pressure drop in ~~cir~~ flow through plates :-

$\bar{u} = -\frac{1}{12\mu} \frac{\partial p}{\partial x} \cdot t^2$



or $\frac{\partial p}{\partial x} = \frac{-12 \mu \bar{u}}{t^2}$

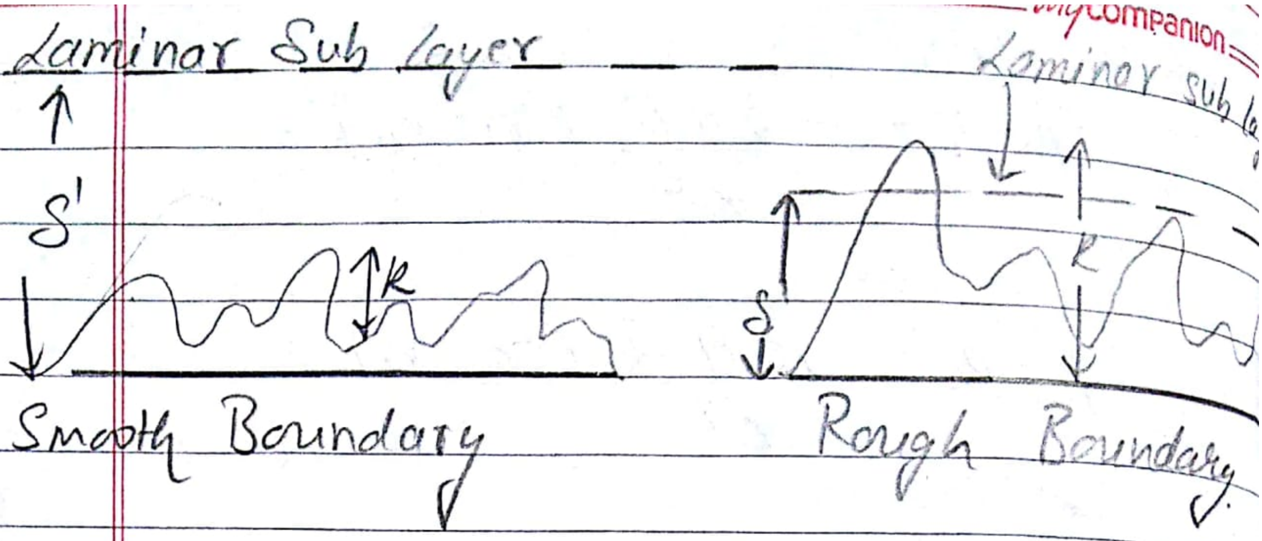
Intergrate w.r.t 'x'

$P_1 - P_2 = \frac{-12 \mu \bar{u}}{t^2} [x_1 - x_2]$

$P_1 - P_2 = \frac{+12 \mu \bar{u} \times L}{t^2}$

$$\left[P_1 - P_2 = \frac{12 \bar{u} \mu L}{t^2} \right] ☆$$

Teacher's Signature



The first portion consists of a thin layer of fluid in the immediate neighbourhood of the boundary, where viscous shear stress predominate while the shear stress due to turbulence is negligible. This portion is known as laminar sub layer. If the average height k of the irregularities, projecting from the surface of a boundary is much less than δ', the thickness of laminar sub layer the boundary is called smooth boundary. If the thickness of laminar sub-layer becomes much smaller than the average height k of irregularities of the surface the boundary will act as rough boundary

If $\frac{k}{\delta'} < 0.25$ boundary is smooth

If $\frac{k}{\delta'} > 6$ the boundary is rough

If $0.25 < \frac{k}{\delta'} < 6$ the boundary is in transition

If $\frac{u_* k}{\nu} < 4$ boundary is smooth

If $\frac{u_* k}{\nu} > 100$ the boundary rough

If $4 < \frac{u_* k}{\nu} < 100$ boundary is in transition stage

$k = 0.15\ mm = .15 \times 10^{-3} m$
$\tau = 4.9\ N/m^2$
$\nu = 0.01$ stokes $= .01 \times 10^{-4}\ m^2/sec$
$\rho = 1000\ kg/m^3$

$u_* = \sqrt{\tau_0/\rho} = \sqrt{\frac{4.9}{1000}} = 0.07\ m/s$

$\frac{u_* k}{\nu} = \frac{0.07 \times .15 \times 10^{-3}}{.1 \times 10^{-4}} = 10.5$

Since $\frac{u_* k}{\nu}$ lies in b/w 4 & 100

hence boundary is in transition stage

Q.5. Explain the Prandtl mixing length theory for turbulent shear stress.

Solⁿ→ Reynolds in 1886 developed an expression for turbulent shear stress b/w two layers. of a fluid at a small distance apart.

$$\tau = \rho u'v'$$

where $u'v'$ = ~~flucuting~~ fluctuating component of velocity in the direction of x & y due to turbulence.

$$\tau = \overline{\rho u'v'}$$

In this eqⁿ it is very difficult to measure $u'v'$. To overcome this difficu, L. Prandtl in 1925, presented a mixing length hypothesis which can be used to express ~~the~~ turbulent shear stress in terms of measurable quantitie

According to prandtl, the mixing length L is that distance b/w two layers in the transverse direction such that the lumps of fluid particles from one layer could reach the other layer and the particles are mixed in the layer in such a way that the momentum of the particles in the direction of x is same. We also assumed that the velocity fluctuation in the x-direction u' is related to the mixing length l as

$$u' = l\frac{du}{dy}$$

and v' the fluctuation component of velocity in y-direction is of the same order of magnitude as u' and hence.

$$v' = l\frac{du}{dy}$$

Now $\overline{u' \times v'}$ becomes as $\overline{u'v'} = l^2\left(\frac{du}{dy}\right)^2$

so $$\tau = \rho l^2 \left(\frac{du}{dy}\right)^2$$

Thus the total shear stress at any point in turbulent flow is the sum of shear stress due to viscous shear and turbulent shear and can written as

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JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY

JAIPUR

I-Mid Term Examination Session 2018-2019

B.Tech 2nd Year 4th Semester

Branch: Civil Engineering
Time: 2.00 – 3.30 PM
Date: 7/3/18

Subject: Surveying I
Subject Code: 4CE4A
Max. Marks: 20

Note: Attempt any four questions out of five questions.

1. Explain the various types of chains and tapes used in measurement
2. Explain the principal of surveying? write any 10 conventional signs.
3. Write the differences between Plane and geodetic surveying.
4. What are the corrections done in tape measurement
5. Explain the difference between prismatic compass and surveyors compass.

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JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY JAIPUR

I / II -MID TERM PAPER ANSWER SHEET

Semester: IV (2nd year) Branch : Civil Engineering(B-Tech)

Subject : Surveying-I Submitted by : Swetha Sing

(5) Explain the difference between Prismatic Compass and Surveyor's Compass.

A:

Prismatic compass	Surveyors Compass
(1) Graduation circle is fixed to broad type needle. Hence, it will not rotate with the line of sight.	- Graduation circle is fixed to the box. Hence, it rotates with the line of sight.
(II) There is a prism at viewing end.	- At viewing end there is no prism. (only a slit).
(III) Sighting and reading can be done simultaneously.	- Sighting & viewing cannot be done simultaneously.
(IV) The magnetic needle do not act as index.	- Magnetic needle acts as index while reading.
(V) The graduations are marked inverted since its reflection is read through prism.	- Graduations are marked directly. They are not inverted.
(VI) The graduations are in whole circle bearing.	- The graduations are in quadrantal system.
(VII) The reading is taken through a prism.	- The reading is taken by directly viewing from top glass.
(VIII) Tripod may or may not be used. It can be held on a stretched hand also.	- Tripod is essential for using it.

③ Write the difference between Plane and Geodetic surveying.

A:

Plane surveying	Geodetic surveying
(I) Curvature of earth is not taken into consideration.	- In this, curvature of Earth is considered.
(II) In plane surveying, line joining any two points of traingle formed by any three points is considered as straight line and plane traingles are assumed to be plane angles.	- In geodetic surveying, line joining two points of traingle formed by three points is considered as curved line of spherical traingle and angles of traingle are considered as spherical angles.
(III) This survey is done on smaller area less than 250 km^2.	- This survey is done on large area greater than 250 km^2.
(IV) Required accuracy is competitively low.	- High accuracy is required
(V) Simple methods and instruments can be used as the required accuracy is low.	- Very refined methods and instruments are used.
(VI) Economic and easy survey method.	- Special instrument needed and long survey method.

1. Explain the various types of chains and tapes used in measurement.

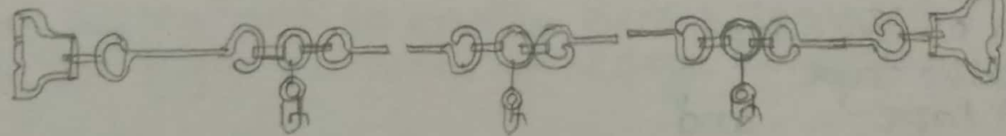
A: Types of chains:

(I) Metric chain
(II) Gunter's chain or Surveyor's chain
(III) Engineer's chain
(IV) Revenue chain and
(V) Steel band or band chain.

(I) Metric chains:

- These are generally available in lengths of 5, 10, 20 & 30 m
- IS : 1492 - 1970 covers the requirements of metric surveying chains.
- To enable the reading of fractions of a chain without much difficulty, tallies are fixed.
  - at every metre for 5 & 10 m lengths chains.
  - at every 5 m length for 20 & 30 m length chains.

  Also, small brass rings are provided at every metre length, except where tallies are attached for 20 & 30 m length chains.



METRE CHAIN

(II) Gunter's chain or Surveyor's chain:

- It is 66 ft. long and consists of 100 links, each link being 0.6 ft or 7.92 inches long.
- Also, when linear measurements are required in furlongs and miles, it is more convenient since 10 Gunter's chain = 1 furlong & 80 Gunter's chain = 1 mile.

(III) Engineer's chain:

- It is 100 ft. long and consists of 100 links, each link being 1 ft. long.
- At every 10 links, brass tags are fastened, with notches on the tags indicating the number of 10 link segments between the tag and end of the chain.

(IV) Revenue chain:

- It is 33 ft. long and consists of 16 links, each link being 2 1/16 ft. long.
- The chain is mainly used for measuring fields in cadastral survey.

(V) Steel band or band chain:

- It consists of a long narrow strip of blue steel, of uniform width of 12 to 16 mm and thickness of 0.3 to 0.6 mm.
- They are available in lengths of 20 or 30 m.
- It is divided by brass studs at every 20 cm & numbered at every metre.
- The first and last links (20 cm length) are subdivided into cm and mm.
- A steel band is lighter than the chain and is easier to handle. But its chief disadvantage is that it is easily broken and difficult to repair in the field.

Types of Tapes:

(I) cloth or linen tape
(II) Metallic tape
(III) Steel tape and
(IV) Invar tape

(I) Cloth or Linen Tape:

- Cloth tapes of closely woven linen, 12 to 15 mm wide varnished to resist moisture, are light and flexible and may be used for taking comparatively rough and subsidiary measurements such as offsets.
- It is commonly available in lengths of 10, 20, 25 and 30 m and in 33, 50, 60 & 100 ft.

- It is rarely used for taking accurate measurements.

(II) Metallic tape:

- It is made of varnished strip of waterproof linen interwoven with small brass, copper or bronze wires and does not stretch as easily as a cloth tape.
- Since metallic tapes are light & flexible and are not easily broken, they are particularly useful in cross-sectioning and in some methods of topography where small errors in the length of the tape are of no consequence.
- They are made in lengths of 2, 5, 10, 20, 30 & 50 m.

(III) Steel tape:

- It consists of a light strip of width 6 to 10 mm and is more accurately graduated.
- Steel tapes are available in lengths of 1, 2, 10, 20, 30 and 50 m.
- A steel tape is a delicate instrument and is very light, and therefore cannot withstand rough usage. The tape should be wiped, clean and dry after using and should be oiled with a little mineral oil, so that it doesnot get rusted.

(IV) Invar Tape:

- It is made of alloy of nickel (36%) and steel, and has very low coefficient of thermal expansion.
- Invar tapes are normally 6 mm wide and are available in lengths of 20, 30 & 100 mm.
- The difficulty with invar tape is that they are much softer and so easily bent & damaged, thus they be kept on reels of large diameter.

(8) ~~Explain the various types of~~ chai

(9) Explain the Principle of surveying? Write any 10 conventional signs.

A: Principle of surveying:

(i) Whole to part.

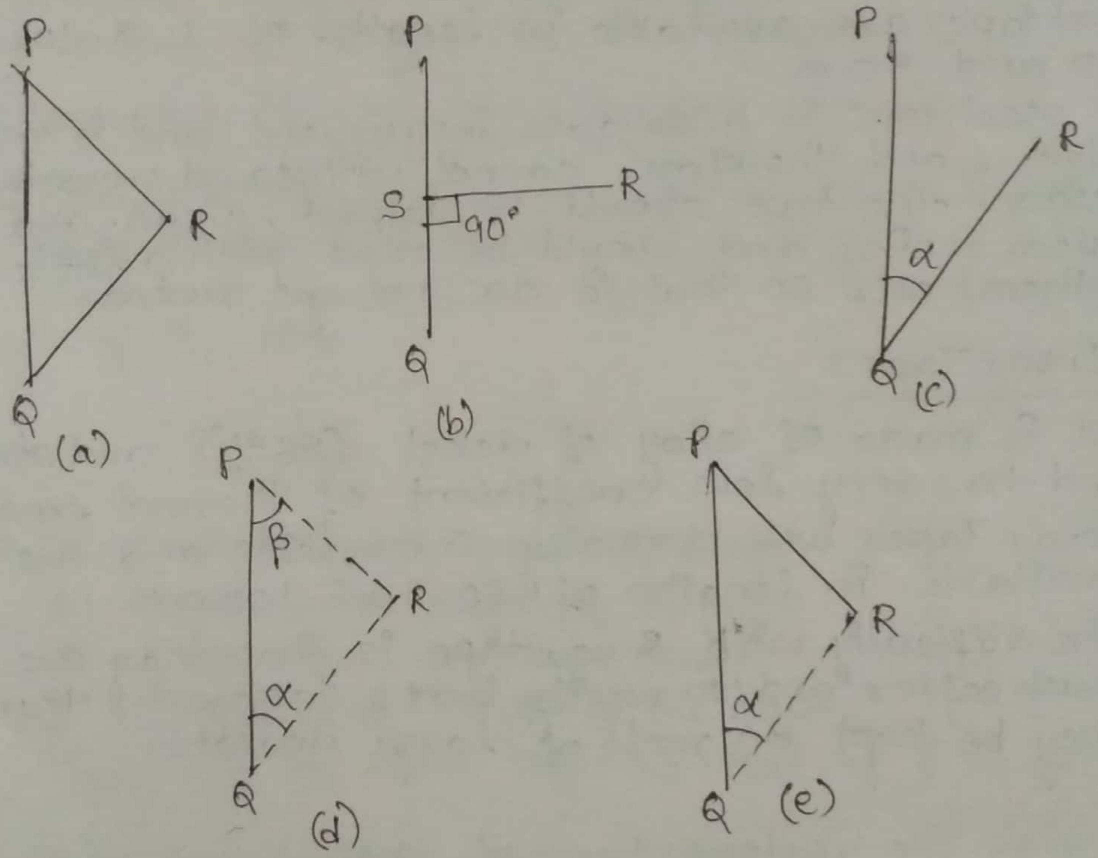
(ii) Location of a point with reference to two Reference points.

(I) whole to Part :

Measure control points are selected and measured with high degree precision. Minor measurements may be taken later on even with less degree of precision, in this way errors in minor details will not reflected in major measurements.

(II) location of a point with reference to two Reference points :

The relative positions of the points to be surveyed should be located by measurement from atleast two points of reference, the positions of which have already been fixed.



LOCATION OF A POINT

Here the points P and Q will thus serve as reference points for fixing the relative positions of other points. Any other point, such as R, can be located by any of the above direct methods.

(4) What are the corrections done in tape measurement.

A: After having measured the length, the correct length of the base is calculated by applying the following corrections:

(I) Correction for absolute length.
(II) Correction for temperature.
(III) Correction for pull or tension.
(IV) Correction for sag.
(V) Correction for slope.
(VI) Correction for alignment.
(VII) Reduction of sea level.
(VIII) Correction to measurement in vertical plane.

- A correction is positive when the erroneous of uncorrected length is to be increased when it is to be decreased to get the true length.

(I) Correction for Absolute length (C_a):

If the absolute length of tape or wire is not equal to its nominal or designated length, a correction will have to be applied to the measured length of the line.

$$C_a = \frac{L \cdot C}{l}$$

where, C_a → Correction for absolute length
L → measured length of the line.
C → correction per tape length.
l → designated length of the tape.
C_a → will be same sign as that of C.

(II) Correction for temperature (C_t):

$$C_t = \alpha (T_m - T_0) L$$

where, α → coefficient of thermal expansion.
T_m → mean temperature in the field during measurement.
T_0 → temperature during standardisation of the tape.
L → measured length.

(iii) Correction for Pull or tension (C_p):

$$C_p = \frac{(P - P_0) L}{AE}$$

where, $P \rightarrow$ Pull applied during measurement (N)
$P_0 \rightarrow$ Standard pull (N)
$L \rightarrow$ measured length (m)
$A \rightarrow$ cross-sectional area of the tape (cm^2)
$E \rightarrow$ Young's Modulus of Elasticity (N/cm^2)

- The pull applied in the field should be <20 times the weight of the tape

(iv) Correction for sag (C_s):

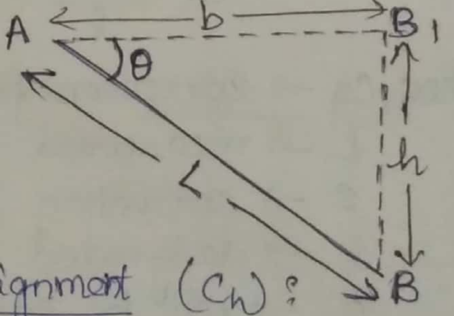
$$C_s = \frac{l W^2}{24 n^2 P^2} = \frac{l (wl)^2}{24 n^2 P^2}.$$

where, $l \rightarrow$ total length of tape; $W \rightarrow$ total weight
$n \rightarrow$ no. of equal spans; $P \rightarrow$ pull applied.

Normal Tension (P_n): Equating Pull and sag corrections,
we get, $$P_n = \frac{0.204 W_1 \sqrt{A \cdot E}}{\sqrt{P_n - P_0}}$$

(v) Correction for Slope or Vertical Alignment (C_v):

$$C_v = \frac{h^2}{2L} \text{ (subtractive)}$$

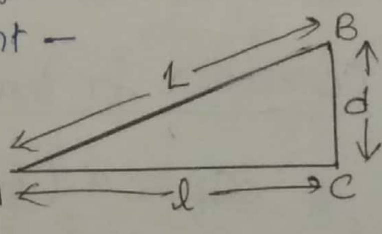


Total slope correction = $\Sigma \frac{h^2}{2L}$.

(vi) Correction for horizontal Alignment (C_h):

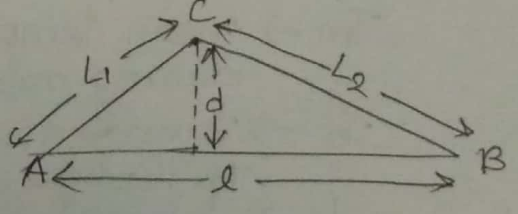
(a) Bad ranging or misalignment -

$$C_h = \frac{d^2}{2L}$$



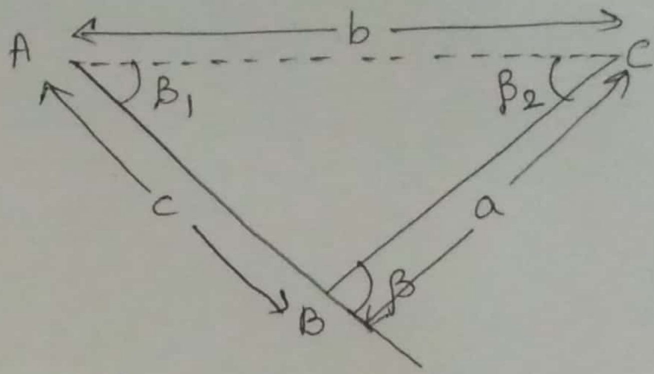
(b) Deformation of the tape in horizontal plane -

$$C_h = \frac{d^2}{2L_1} + \frac{d^2}{2L_2}.$$



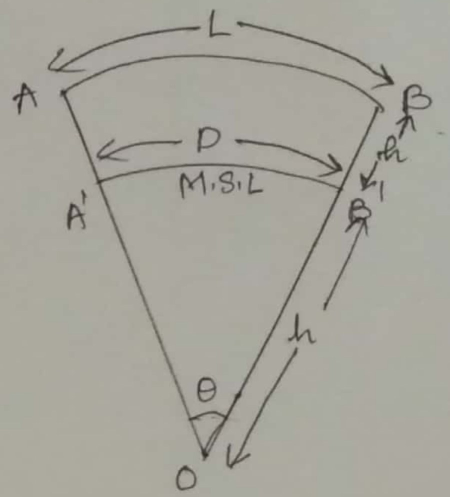
(C) Broken line –

$$C_h = (a+c) - b.$$
(subtractive).



(VII) Reduction to Mean Sea level (C_{msl}):

$$C_{msl} = L - D$$
$$= L - \left(L - \frac{Lh}{R}\right)$$
$$\therefore C_{msl} = \frac{Lh}{R} \quad \text{(subtractive)}$$



(VIII) Correction to measurement in vertical plane (s):

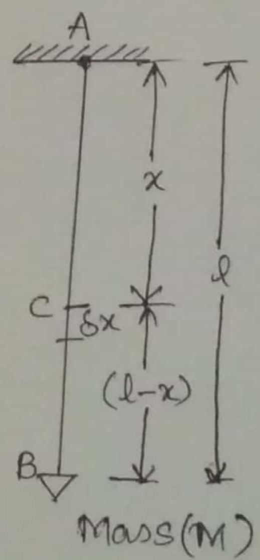
By Hooke's law,

$$\delta s_x = \frac{P(\delta x)}{AE}$$

– $\therefore s = \frac{mgl^2}{2AE}$

– General equation for precise measurement is;

$$s_x = \frac{gx}{AE}\left[M + \frac{1}{2}m(2l - x) - \frac{P_0}{g}\right]$$



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JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY

I-Mid Term Examination Session 2018-2019

B.Tech 2nd Year 4th Semester

Branch: Civil Engineering
Time: 10.00 – 11.30 AM
Date: 8/3/18

Subject: Building Planning
Subject Code: 4CE5A
Max. Marks: 20

Attempt any 4 questions, All carry equal marks.

1. A) Discuss the different type of building in detail?
   B) What are the factors of affecting the selection of site? Explain?
2. Discuss the different method of drawing sun chart or sun path and use of sun path diagram?
3. A) Write about the passive solar cooling and heating?
   B) Describe the types of sun shading devices?
4. What do you understand by energy conservation in building and what techniques are used for the same?
5. A) Differentiate between:
   (i) Commercial buildings
   (ii) Institutional building.
   B) List various factors to be considered in the planning of a building, with the help of sun diagram?

JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY JAIPUR
I / II -MID TERM PAPER ANSWER SHEET

Semester: IV
Subject: BUILDING TECHNOLOGY
Branch: CIVIL
Submitted by: DR. MAYANK VARSHNEY

Q.1 (a) Discuss the different type of building in detail.

Soluⁿ :— Buildings can be classified depending upon the character of occupancy or the type of use as following:—

(i) Residential :— sleeping accomation for normal residential purpose with or without cooking & dining, i.e dwellings, apartments, houses, restaurants, hostels, dormitories, hotels etc.

(ii) Educational :— School, college or day care involving assembly for instruction, education or recreation

(iii) Institutional :— different purposes such as medical, treatment, care, convalescents, aged persons i.e hospitals, sanitoria, institutions, jail. etc.

(iv) Assembly :— Groups of people meet or gather for amusement, recreation, social, religious, political etc. i.e theatre, assembly halls, marriage halls, auditoriums, exhibition halls museums, gymnasiums, worship places, dance halls, clubs etc.

(v) Business :— transaction of business, keeping accounts, records — public business like offices, banks, courts, library etc.

(vi) Merchantile :— shops, stores, market for display, sale of merchandise etc

(vii) Industrial :— fabrication of products or materials, & processing like industries, refineries, plants, mills, dairies etc.

(viii) Storage :— storage/sheltering of goods, wares or merchandise like warehouses, cold storages etc.

Q.1 (b) What are the factors of affecting the selection of site? Explain?

Solu

Soluⁿ: Following factors for selection of site should be considered.

a) Soil should have good bearing capacity & have hard strata

b) location at elevated ground, slope towards front street to afford good drainage.

c) Stagnation of water for low lying areas to be avoided.

d) Avoid sites of made up or reclaimed soils as they absorb water, become water logged & emnate foul smell. which is detrimental to human health.

e) vicinity to ponds, pools of water, water logged areas to be avoided

f) Sites near road with high traffic, heavy industrial areas to be avoided

g) Sites near high voltage power transmission lines should be avoided.

h) sites near big shopping complexes, markets, transportation complex etc to be avoided.

i) surroundings of site should be pleasing & calm.

j) Reasonable depth of ground water

k) exposed to hard rocks are not preferable.

l) Approved by local bodies

Q. 2 Discuss the different method of drawing sunchart or sun path & use of sun path diagram?.

Solⁿ :— Sunpath diagrams :— represent annual changes in the path of the sun through the sky on a single 2D diagram. Solar Azimuth & altitude can be read off directly for any time of the day & month of the year.

Method to draw :—

a) Obtain altitude & azimuth of sun of a particular place of particular latitude for any particular day from the meterological data book.

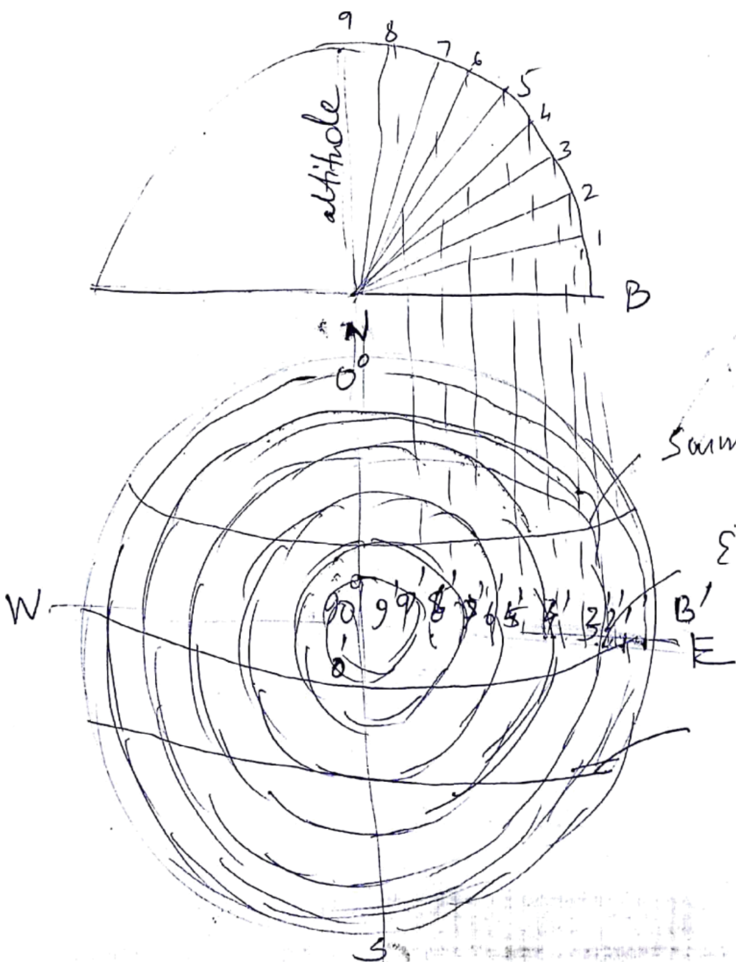
b) Draw semispherical vault with "O" as centre

c) Draw horizontal line through O.

d) Draw vertical line through O cutting semicircle in point C. Divide AC arc into equal parts. Divide into 9 parts. say 1,2,3 ----9.

e) project the division parts 1,2,3 .... from circumference on line O'B'

f) Draw concentric circles O'1', O'2' ..... O'8' with O' as centre.



...ximum of Rs.300 ...inar/Conference/Workshop/FDP etc.

3.2. Outside Jaipur:

Q.3 (A) Write about the passive solar cooling & heating.

Solu^n :- Passive solar heating is a building design in which solar energy provides significant heating without fans or pumps. Building serves as solar collector & heat storage system. It is most cost effective. No use of Mechanical equipment. Heat flow is by radiation, convection & conductance. Provides passive solar heating for daylighting & view through well positioned windows.

For solar passive heating – South facing exposure of transparent material & material to absorb & store the heat for later use.

Passive solar cooling :– cooling without air conditioning just using shading strategies, natural ventilation & adequate construction materials.

(B) Describe the types of sun shading devices :–

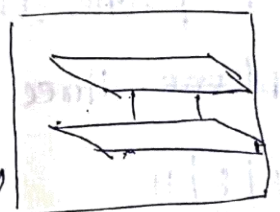
Solu^n :– To guard the structure against effects of high wind and heavy rain, in addition to protection against sun. a) Natural b) Artificial.

(a) Natural

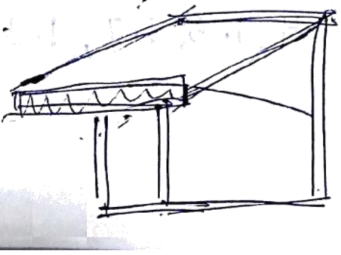
Grow plants & trees at suitable places around the building. Trees provide shade in summer & allow sun rays to enter the buildings in winter. & also do not interfer with the circulation of air around the building.

(b) Artifical

(i) louvers :— It means series of inclined horizontal slits fixed in a window frame



(ii) overhangs – means element of construction projecting outwards beyond the ext. vertical face of the wall.



(iii) screens – attached to buildings.

Q.4 What do you understand by energy conservation in building & what techniques are used for the same.

Soln :- Energy conservation is the reduction of quantity of energy used. It supports eco-friendly lifestyle by providing energy, which saves money. decreasing the amount of energy automatically reduces the global warming.

Sources of energy conservation :-
Solar energy, Photovoltaic system, solar hotwater, solar Power plants, Passive solar heating & daylighting.
Windenergy - ecofriendly
Geothermal energy -
Wave energy, Hydro electric energy, Biomass energy

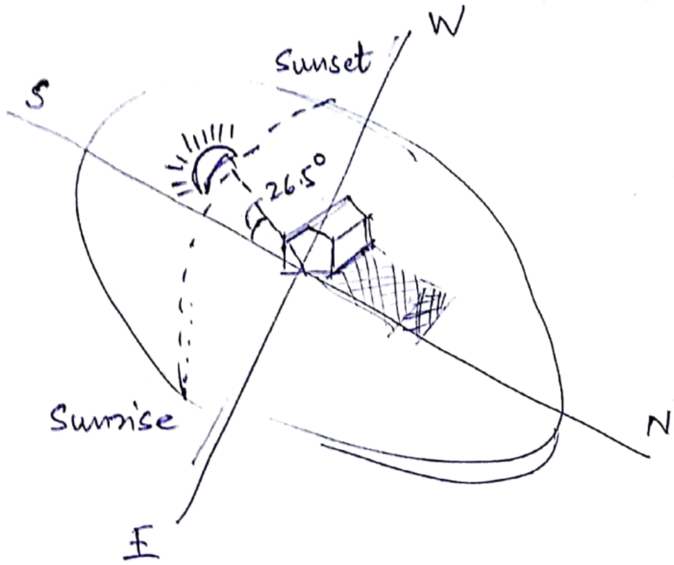
Typical energy saving approach
orientation, building envelope, Equipment & systems, Lighting, LEED & ECBC & IGBC.
Awareness & Training.
availability
Follow of National codes & standards. (ECBC)

Q.5 (A) Differentiate between commercial & Institutional Building.

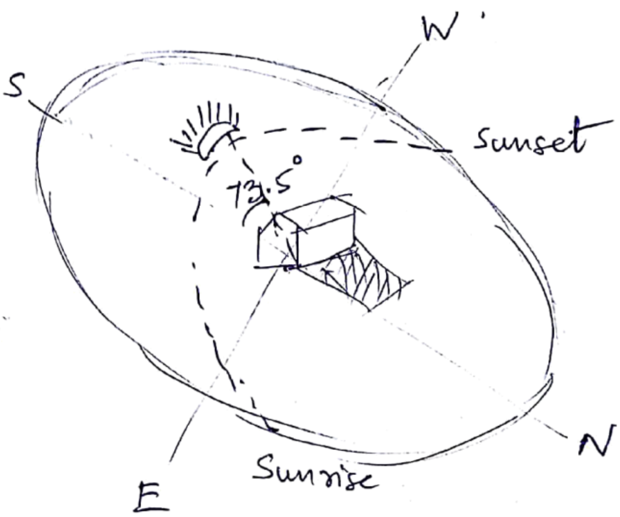
COMMERCIAL	INSTITUTIONAL
It has commercial venture & deals in transaction of business	Buildings are used for official purpose, illness, disease, accomodation to person
function of buildings is transaction of public business.	Includes hospitals, sanitoria, Jails etc are also included in these types.

Q. 5 (B) List various factors to be considered in the Planning, with the help of sun diagrams.

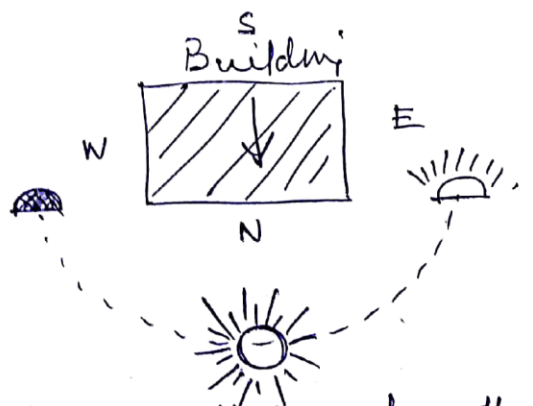
Soln :— Sun path diagrams are convenient way of representing annual changes in the path of the sun through the sky on a single 2D diagram. Their most immediate use is that the solar azimuth & altitude can be read off directly for any time of the day & month of the day. They provide summary of solar position that the architect can refer to when considering shading requirements, orientation of the building & design options.



Sun in winter



Sun in summer



Large walls towards north.

JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY JAIPUR

JNIT

I / II -MID TERM PAPER ANSWER SHEET

Semester: IV

Subject : QSV

Branch : Civil Engg.

Submitted by : Jagriti Gupta

Q1 ① Cube rate estimate → In this estimate, the estimate is done by calculating the volume of the building from plinth level to the floor level by calculating the length, breadth and height of the building accurate & then calculating cubic meter rate which is subjected from the cost of similar type of building.

② Schedule of rate → It is the table in abstract from in which the rate per unit of the material are given for a particular construction work in an area. The rates are authorized for the material of that area.

③ Revised estimate → The revised estimate is a detailed estimation in which the estimation is revised again or formed again due to main reasons as, The material to be used is changed due to some reason. Increased by 5% of taken cost of any material.

④ Plinth area estimate → In this, the estimation is done on the basis of the plinth area of the plot where construction is taking place. The plinth area is calculated and then it is multiplied with the plinth area rate of the building.

...n & No. | length | ...

Q2 Long wall / Short wall method →

Actual length of LW → 5+5+0.4+0.4 = 10.8 m

Actual length of SW → $7+\frac{0.4}{2}+\frac{0.4}{2} = 7.4$ m

S.No	Item No.	No.	length	breadth	ht	Qua.	Remark
1	Excavation						
	LW	2	11.8	1	1.3	30.68	10.8+1
	SW	3	6.4	1	1.3	24.96	7.4-1
						55.64 m³	
2	Foundation						
	LW	2	11.8	1	0.3	7.08	10.8+1
	SW	3	6.4	1	0.3	5.76	7.4-1
						12.84 m³	
3	1st footing						
	LW	2	11.6	0.8	0.3	5.57	10.8+0.8
	SW	3	6.6	0.8	0.3	4.76	7.4-0.8
						10.33	
4	2nd footing						
	LW	2	11.5	0.7	0.4	6.44	10.8+0.7
	SW	3	6.7	0.7	0.4	5.63	7.4-0.7
						12.07	
5	3rd footing						
	LW	2	11.3	0.5	0.3	3.39	10.8+0.5
	SW	3	6.9	0.5	0.3	3.10	7.4-0.5
						6.49 m³	

S.No	Item No.	No.	length	breadth	height	Quantity	Remarks
6	DPC						
	LW	2	11.3	0.5	-	11.30	10.8 + 0.5
	SW	3	6.9	0.5	-	10.35	7.4 - 0.5
						21.65 m^3	
	Deduction						
	Door	2	1.2	0.4	-	(- 0.96)	
	Superstructure						
	LW	2	11.2	0.4	5	44.8	10.8 + 0.4
	SW	3	7.4	0.4	5	42.0	7.4 - 0.4
						86.8 m^3	
	Deduction						
	Door	2	1.2	0.4	2.4	2.30	
	window	2	1	0.4	1.5	1.2	
	Selves	3	1	0.2	1.5	0.9	
	Ventilation	2	1	0.4	1	0.8	
	Lintel						
	Door	2	1.2	0.4	0.15	0.14	
	Window	2	1	0.4	0.15	0.12	
	selves	3	1	0.2	0.15	0.09	
						(- 5.55 m^3)	

total Material = 199.31 m^3

Q3

~~No.~~ ~~Item No.~~

Centre line Method →

Actual length = 2(10 + 0.4 + 0.4) + 3(7 + 0.4)

21.6 + 22.2 = 43.8

S.No.	Item No.	No.	L	B	h	Q.	Remarks
1	Excavation		42.8	1	1.1	47.08	43.8 − 1
2	Foundation		42.8	1	0.3	12.84	
3	1st Footing		43	0.8	0.3	34.4 × 0.3	43.8 − 0.8
4	2nd footing		43.1	0.7	0.4	12.1	43.8 − 0.7
5	3rd footing		43.3	0.5	0.3	6.49	43.8 − 0.5
6	DPC		43.3	0.5	–	12.99	
	Deduction Door	2	1.2	0.5	–	0.6	
						12.39	
7	Super structure		43.4	0.4	5	86.8	43.8 − 0.4
	Deduction						
	Door	2	1.2	0.4	2.4	2.31	
	window	2	.1	0.4	1.5	1.2	
	selves	3	1.0	0.9	1.5	0.9	
	Ventilation	2	1	0.4	1	0.8	total = 86.8 − = 81.2
	Lintel						
	Door	2	1.2	0.4	0.15	0.14	Grand total =
	window	2	1	0.4	0.15	0.12	
	selves	3	1	0.2	0.15	0.09	189.21 m
	Ventilation	2	1	0.4	0.15		

Q4

S.NO.	Material	Quantity	Rate	Cost
1	Cement	2.8	10500	29400
2	Sand	4.2	1000	4200
3	Ballast	8.4	2000	16800
4	Steel 2%	15.79	5000	78500
5	Bending wire	2kg	100	200
			total	129,100
	labour			
1	Head Mason	1	500	500
2	Mistri	2	400	800
3	Mazdoor	12	350	4200
4	w/m collie	20	300	6000
5	Bhisti	1	200	200
	lumpsump		200	200
			total	11900

	Centering / shuttering			
1	Blacksmith	8	250	2000
2	Mistri	8	250	2000
3	Lum sump			
			total	4000

Bending / binding

1	Carpenter	5	350	1750
2	wooden plank	-	1500	1500
3	Mistri	5	300	1500

Lumsump	500	—	500
		total	5950 ₹

total cost = 34750

$1\frac{1}{2}\%$ water charge = 521.25

10% contractor = 3475

grand total = 38746.25 for 10 m^3

for 1 m^3 = 3874.63 ₹

Q5

lime $= \frac{1}{7} \times 15.2 = 2.2\ m^3$

sand $= \frac{2}{7} \times 15.2 = 4.4\ m^3$

ballast $= 4 \times 2.2 = 8.8\ m^3$

S.No.	Material	Quantity	Rate	cost
1	Lime	2.2	700	1540
2	Sand	4.4	1000	4400
3	ballast	8.8	1600	14080
				20020 ₹
	labour			
1	Mistri	1	500	500
2	Mason	2	450	900
3	Bhisti	1	300	300
4	W/M collie	18	250	4500
5	Mazdoor	12	200	2400

total ⇒ 8600

$1\frac{1}{2}\%$ water charge = 429.3 ₹

10% contractor = 2862 ₹