Experiment No. :..... Date :.....

iii) Tension → Masonry & concrete are weak in tension so that they are usually designed in such a way that there is no tension anywhere.

* Problems:

1). A retaining wall 6m high & 2.5m wide retains water upto its top. Find the total pressure per metre length of the wall and the point at which the resultant cuts the base. Also find the resultant thrust on the base of the wall per meter length. Assume weight of masonry as 23 KN/m^3.

Given:-

$H = 6m$

$b = 2.5m$

$\rho = 23\ KN/m^3$

$\gamma_w = 9.81\ KN/m^3$

Total pr. per meter length of the wall,

$$P = \frac{WH^2}{2} = \frac{9.81 \times 6^2}{2} = 176.6\ KN.$$

Points at which the resultant cuts the base.

$$W = 23 \times 6 \times 2.5 = \rho \times H \times b = 345\ KN.$$

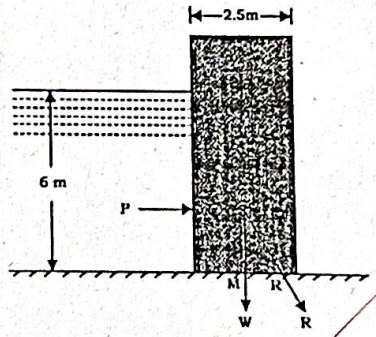
Distance b/w the mid-point (M) of the wall & the point where resultant cuts the base (R)

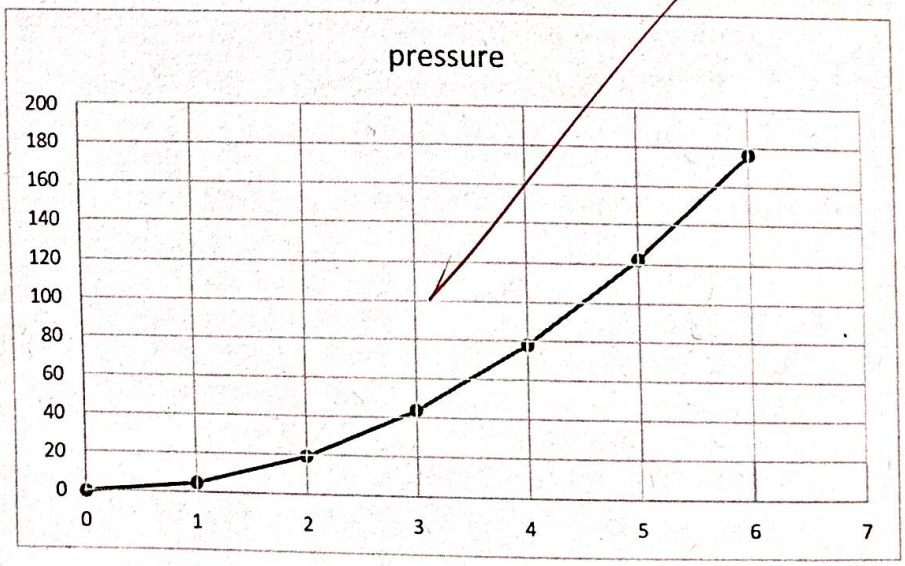
$$\bar{x} = \frac{P}{W} \times \frac{H}{3} = \frac{176.6}{345} \times \frac{6}{3} = 1.02m.$$

A retaining wall 6m high and 2.5m wide retains water up to its top. Find the total pressure per meter length of the wall and the point at which the resultant cuts the base. Also find the resultant thrust on the base of the wall per meter length. Assume weight of masonry as 23 KN/m

Given Details			
Weight of retaining walls	H	6	m
Width of retaining wall	b	2.5	m
Weight of retaining walls	W	23	KN/m3
Total pressure per meter length of the wall		176.4	KN
Points At which the resultant cuts the base	W	345	KN
	X	1.022609	m
Resultant thrust on the base of the wall per meter length	R	387.4816	m
weight of water	w	9.81	kN/m3
Total Pressure per meter length of the wall		176.4	KN
Points Resultant at which the resultant cuts the base (from the mid-point of the wall)		1.022609	m
Resultant thrust on the base f the wall per meter length		387.4816	m

Height	pressure
6	176.58
5	122.625
4	78.48
3	44.145
2	19.62
1	4.905
0	0





Experiment No. :..... Date :.....

→ Resultant thrust on the base of the wall per meter length, $R = \sqrt{P^2+W^2} = \sqrt{(176.6)^2+(345)^2} = \underline{387.6m}$.

Experiment No. :..... Date :.....

2. A concrete dam having water on ~~vertical~~ vertical face is 16 m high. The base of the dam is the 8m wide and top 3m wide. Find the resultant thrust on the base per meter length of the dam & the point of where it intersects the base, where it contains where 1km deep. Take weight of the concrete as 23 KN/m³.

→ Given :-

H = ht. of dam = 20m.

b = base width = 8m.

a = Top width = 3m.

h = depth of water = 16m.

wt. of concrete = 24 KN/m³.

→ Resultant thrust on the base per meter length of the dam.

$$P = \frac{WH^2}{2} = \frac{9.81 \times 16^2}{2} = 1257.97 \text{ KN}.$$

→ Weight per meter length of the dam

$$W = 24 \times \frac{(8+3)}{2} \times 20 = 2640 \text{ KN}.$$

→ resultant thrust on the base per meter length of the dam.

$$R = \sqrt{P^2 + W^2} = \sqrt{(1255.7)^2 + (2640)^2}$$

$$= 2923.4 \text{ KN}.$$

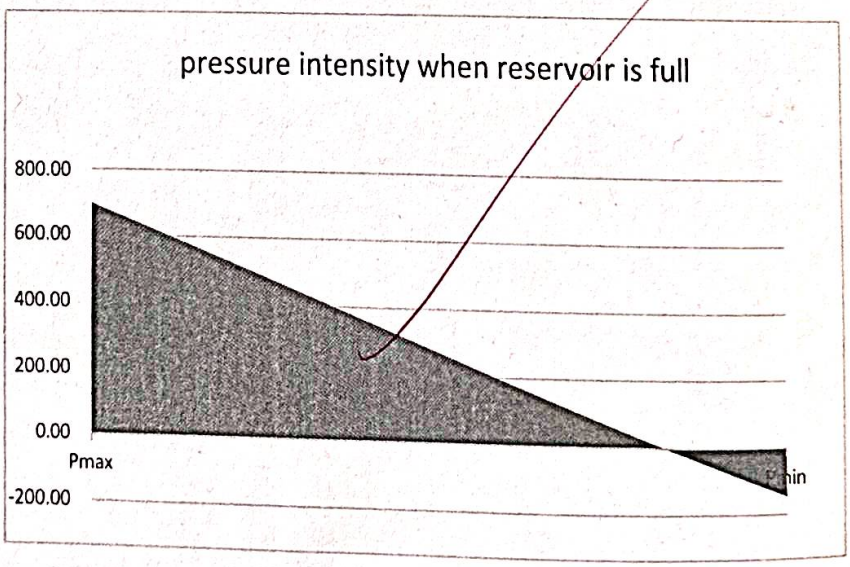
→ $\bar{x} = \frac{a^2 + ab + b^2}{3(a+b)} = \frac{3^2 + (3 \times 8) + 8^2}{3(3+8)} = 2.94\text{m}.$

→ $Z = \bar{x} + \frac{h}{3} \times \frac{P}{W} = 2.94 + \frac{16}{3} \times \frac{1257.7}{2640} = 5.48\text{m}.$

A masonry dam of trapezoidal section having water on vertical face is 16m high. The base of the dam is 8m wide and top 3m wide, Find 1) resultant thrust on the base per metre length of the dam.2) point, where resultant thrust cuts the base. 3)Thee intensity of maximum and minimum stress across the base. Take weight of masonry 25kN /m^3 and that of water 10 kN/m^3.Assume water may rise upto the top level of the dam

Given details	value	unit
a	3	m
b	8	m
H	16	m
roh	25	KN/m^3
w	10	KN/m^3

Step 1					
weight of the dam per unit weight			W	2200.00	kN
Step 2					
Toral pressure per unit length of the dam			p	1280.00	kN
resultant thrust on the dam			R	2545.27	kN
Step 3					
			X-bar	2.94	m
Step 4			Z	6.04	m
Step 5					
Eccentricity of the resultant			e	2.04	m
Maximum intensity of the pressure at base			Pmax	696.25	KN/m^2
Minimum intensity of pressure at base			Pmin	-146.25	KN/m^2



Experiment No. :..... Date :.....

3). A masonry retaining wall, trapezoidal in section, with face vertical is 1 m wide at top & 3m at the base & 8m high. The material retained on the vertical face exerts a lateral pressure varying from zero at top to 25 KN/m² at the base. If the unit weight of masonry is 27 KN/m. Calculate the maximum & minimum stress intensities.

Given :-

$a = 1m$.

$b = 3m$.

$H = 8m$.

$\gamma_{oh} = 21\ KN/m^3$.

$w = 10\ KN/m^3$.

lateral pressure $= 25\ KN/m^2$.

→ Weight of the dam per unit wt. ht. $= f \times \left(\frac{a+b}{2}\right) H$

$= 21 \times \left(\frac{1+3}{2}\right) \times 8 = 336\ KN$.

→ Total pressure per unit length of the dam.

Total lateral thrust $P = \frac{1}{2} \times 25 \times 8 = 100\ KN$.

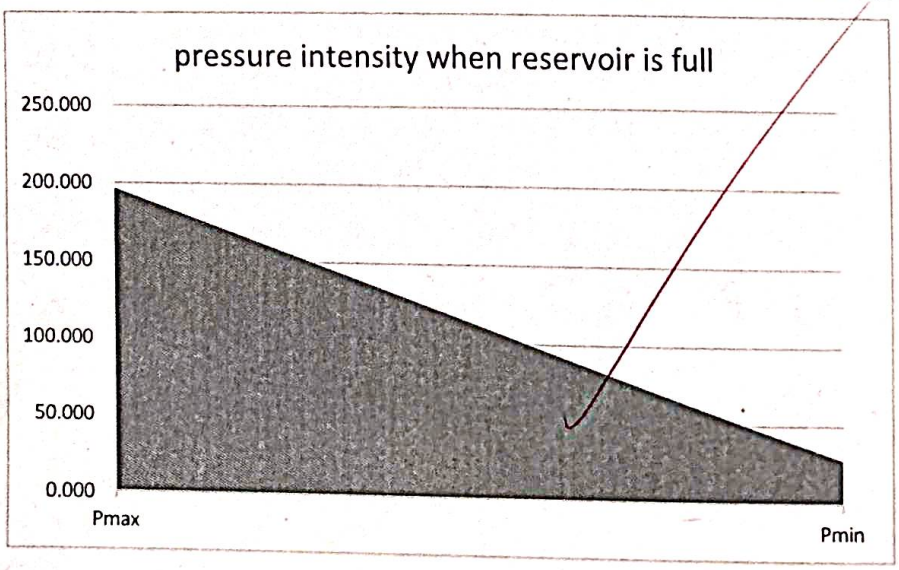
→ $\bar{x} = \frac{a^2 + ab + b^2}{2(a+b)} = \frac{1^2 + (3 \times 1) + 3^2}{2(1+3)} = 1.083\ m$.

→ $Z = \bar{x} + \frac{h}{3} \times \frac{P}{W} = 1.083 + \frac{8}{3} \times \frac{100}{3360} = 1.877m$.

A masonry retaining wall, trapezoidal in section. with one face vertical is 1 m wide at top and 3 m at the base and 8 m high The material retained on the vertical face exerts a lateral pressure varying from zero at top to 25 kNIm² at the base. If the unit weight of masonry is 21 kN/m, calculate the maximum and minimum stress intensities

Given details	value	unit
a	1	m
b	3	m
H	8	m
roh	21	KN/m^3
w	10	KN/m^3
lateral pressure	25	KN/m^2

Step 1					
weight of the dam per unit weight			W	336	kN
Step 2					
Toral pressure per unit length of the dam			p	100	kN
Step 3					
			X-bar	1.083	m
Step 4			Z	1.877	m
Step 5	When reservoir is full				
Eccentricity of the resultant			e	0.377	m
Maximum intensity of the pressure at base			Pmax	196.444	KN/m^2
Minimum intensity of pressure at base			Pmin	27.556	KN/m^2



Experiment No. :..... Date :.....

→ Eccentrity $= 2 - \frac{b}{2} = 1.877 - \frac{3}{2} = 0.377m.$

→ Max. intensity of pressure at base,

$$P_{max} = \frac{W}{b}\left(1 + \frac{6e}{b}\right) = \frac{336}{3}\left(1 + \frac{6 \times 0.377}{3}\right)$$

$$= 196.44 \ KN/m^2.$$

Min. intensity of pressure at base,

$$P_{min} = \frac{W}{b}\left(1 - \frac{6e}{b}\right) = \frac{336}{3}\left(1 - \frac{6 \times 0.377}{3}\right)$$

$$= 27.556 \ KN/m^2.$$

Experiment No. :..... Date :.....

4) A masonry dam 1.2m wide at top & 3.2m wide at bottom & 5m high. It has vertical water face exposed to water. If the water is likely to rise to the top of the dam, calculate the max. & min. pressure at the base when the dam is full & when the dam is empty. Take density of masonry = 22.4 KN/m³. Density of water = 10 KN/m³. Draw the stress intensity diagram for both cases.

Given :-

$a = 1.2\,m.$

$b = 3.2\,m.$

$\gamma_{sh} = 22.4\ KN/m^3.$

$W = 10\ KN/m^3.$

→ Weight of the dam per unit length.

$$W = \rho\left(\frac{a+b}{2}\right)H = 246.4\ KN.$$

→ Total pressure per unit length of the dam,

$$P = \frac{Wh^2}{2} = \frac{10 \times 5^2}{2} = 125\ KN.$$

→ $$\bar{x} = \frac{a^2 + ab + b^2}{3(a+b)} = \frac{1.2^2 + (1.2 \times 3.2) + 3.2^2}{3(1.2 + 3.2)}$$

$$= 1.18\,m.$$

→ $$z = \bar{x} + \frac{h}{3} \times \frac{P}{W} = 1.18 + \frac{5}{3} \times \frac{125}{246.5} = 2.02\,m.$$

Experiment No. :..... Date :.....

When reservoir full,

eccentricity $e = 2 - \frac{b}{2} = 2.02 - \frac{3.2}{2} = 0.421$.

Max. pressure intensity,

$$P_{max} = \frac{W}{b}\left(1 + \frac{6e}{b}\right) = \frac{246.4}{3.2}\left(1 + \frac{6 \times 0.42}{3.2}\right)$$

$$= 137.82 \text{ KN/m}^2.$$

Min pressure intensity $= \frac{W}{b}\left(1 - \frac{6e}{b}\right) = 16.18 \text{ KN/m}^2$.

→ When reservoir empty,

eccentricity $= e = \frac{b}{2} - \bar{x} = 0.422 \text{ m}$.

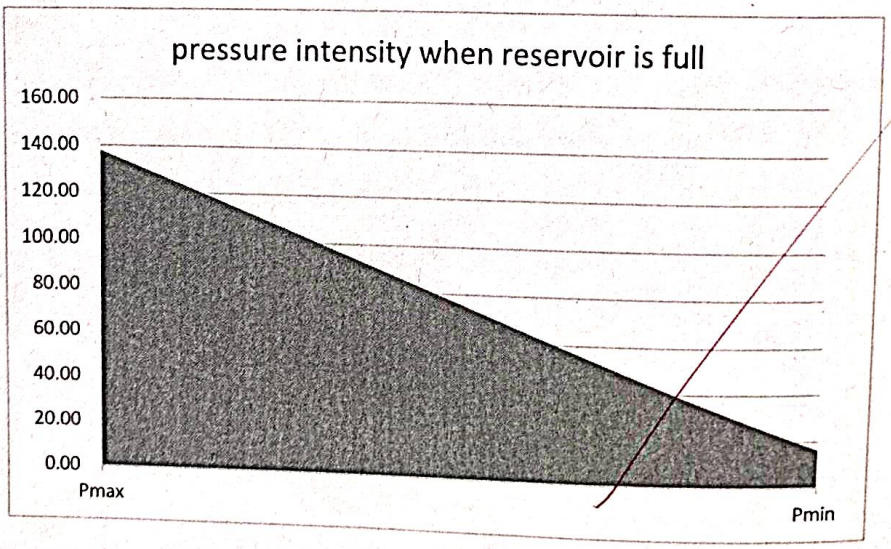
$P_{max} = 138.25 \text{ KN/m}^2$.

$P_{min} = 15.75 \text{ KN/m}^2$.

A masonry dam 1.2 m wide at top and 3.2 m wide at bottom and 5 m high,. It has vertical water face exposed to water .If the water is likely to rise to the top of the dam , calculate the maximum and minimum pressure at the base when the dam is full and when the dam is empty. Take density of masonry = 22.4 kn/m^3. Density of water = 10kn/m^3. Draw the stress intensity diagram for both cases.

a	1.2	m
b	3.2	m
H	5	m
roh	22.4	KN/m^3
w	10	KN/m^3

Step 1				
weight of the dam per unit weight		W	246.4	kN
Step 2				
Toral pressure per unit length of the dam		p	125	kN
Step 3				
		X-bar	1.18	m
Step 4		Z	2.02	m
Step 5	When reservoir is full			
Eccentricity of the resultant		e	0.42	m
Maximum intensity of the pressure at base		Pmax	137.82	KN/m^2
Minimum intensity of pressure at base		Pmin	16.18	KN/m^2
Step 6	When reservoir is empty			
Eccentricity of the resultant		e	0.42	m
Maximum intensity of the pressure at base		Pmax	138.25	KN/m^2
Minimum intensity of pressure at base		Pmin	15.75	KN/m^2



Experiment No. :..... Date :.....

5). A masonry dam 2m wide at top & 7m wide at bottom & 16 m high. Water imposed upto a ht. of 15m, the water face being vertical. Determine the normal stress intensity at the base, both when the dam is empty & fully. Take density of masonry = 22.4 KN/m³. Density of water = 10 KN/m³. Draw the stress intensity diagram for both case.

→ $a = 2m$.

$b = 7m$.

$H = 16m$

$h = 15m$.

$\gamma_{oh} = 24\ KN/m^3$.

$W = 10\ KN/m^3$.

→ Weight of the dam per unit weight, $W = \rho \times \frac{(a+b)}{2} \times H$

$= 24 \times \left(\frac{2+7}{2}\right) \times 16 = 1728\ KN.$

→ Total pressure per unit length of the dam,

$P = \frac{Wh^2}{2} = \frac{10 \times 15^2}{2} = 1125\ KN.$

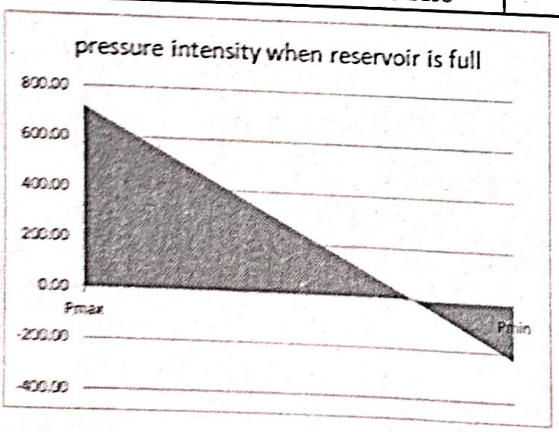
→ $\bar{x} = \frac{a^2 + ab + b^2}{3(a+b)} = 2.48\ m.$

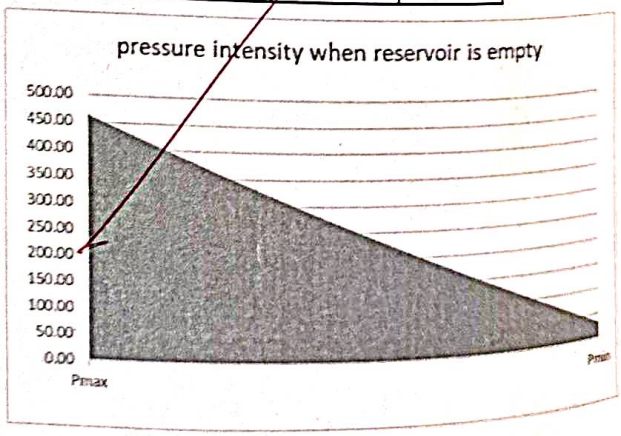
$z = \bar{x} + \frac{h}{3} \times \frac{P}{W} = 2.48 + \frac{15}{3} \times \frac{1125}{1728} = \underline{\underline{5.74}}.$

A masonry dam 2 m wide at top and 7 m wide at bottom and 16 m high. Water imposed up to a height of 15 m, the water face being vertical. Determine the normal stress intensities at the base, both when the dam is empty and full. Take density of masonry = 22.4 kn/m^3. Density of water = 10kn/m^3. Draw the stress intensity diagram for both cases.

Given details	value	unit
a	2	m
b	7	m
H	16	m
h	15	m
roh	24	KN/m^3
w	10	KN/m^3

Step 1					
weight of the dam per unit weight			W	1728.00	kN
Step 2					
Toral pressure per unit length of the dam			p		
				1125.00	kN
Step 3					
			X-bar	2.48	m
Step 4					
Step 5			Z	5.74	m
Eccentricity of the resultant					
Maximum intensity of the pressure at base			e	2.24	m
Minimum intensity of pressure at base			Pmax	720.12	KN/m^2
Step 6			Pmin	-226.41	KN/m^2
Eccentricity of the resultant					
Maximum intensity of the pressure at base			e	1.02	m
Minimum intensity of pressure at base			Pmax	462.37	KN/m^2
			Pmin	31.35	KN/m^2





Experiment No. :..... Date :.....

when reservoir is full,

eccentricity $(e) = z - \frac{b}{2} = 5.74 - \frac{7}{2} = 2.24m.$

$P_{max} = \frac{W}{b}\left(1 + \frac{6e}{b}\right) = 720.12\ KN/m^2.$

$P_{min} = \frac{W}{b}\left(1 - \frac{6e}{b}\right) = 226.41\ KN/m^2.$

when resorvoir is empty,

$e = \frac{b}{2} - \bar{x} = \frac{7}{2} - 7.48 = 1.02m.$

$P_{max} = 462.68\ KN/m^2.$

$P_{min} = 31.03\ KN/m^2.$

Experiment No. :..... Date :.....

6). A masonry dam of trapezoidal section having water on vertical face is 16m high. The base of the dam is 8m wide & top 3 m wide.

Find :-

i) Resultant thrust on the base per metre length of the dam.

ii) Point where resultant thrust cuts the base.

iii) The intensity of max. & min. stress across the base.

Take weight of masonry 25 KN/m³ & that of water 10 KN/m³. Assume water may rise upto the top of the dam.

→ $a = 3m$.

$b = 8m$.

$H = 16m$.

$\gamma_{sh} = 25$ KN/m³.

$W = 10$ KN/m³.

→ weight of the dam per unit wt. $(W) = 1 \times \left(\frac{a+b}{2}\right) \times H$

$W = 2200$ KN.

→ Total pr. per unit length of the dam,

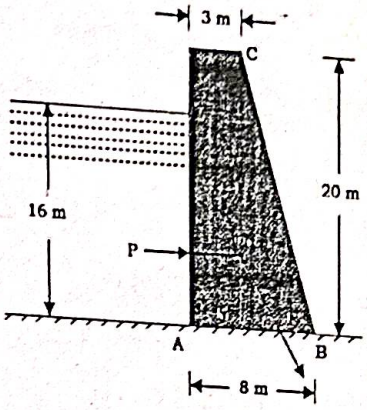
$$P = \frac{W \times h^2}{2} = \frac{10 \times 16^2}{2} = 1280 \text{ KN}.$$

→ Resultant $(R) = \sqrt{P^2 + W^2} = \sqrt{1280^2 + 2200^2}$

$= 2545.27$ KN.

Problem A concrete dam having water on vertical face is 16m high. The base of the dam is 8m wide and top 3m wide. Find the resultant thrust on the base per meter length of the dam and the point of where it intersects the base, where i contains water 16m deep. Take weight of the concrete as 23 KN/m3

Given Details		
Height of Dam	20	m
Base width	8	m
Top width	3	m
Depth of water	16	m
Weight of concrete	24	KN/m3



1	Resultant Thrust on the base per meter length of the dam	P	1255.68	KN
2	Weight per unit length of dam	W	2640	KN
3	Resultant thrust on the base of the wall per meter length	R	2923.411	KN
4	Point of resultant thrust intersect the base	AM	323.3333 3.233333 5.48	M

Experiment No. :..... Date :.....

$\rightarrow \bar{x} = \frac{a^2 + ab + b^2}{3(a+b)} = 2.94\,m.$

$\rightarrow z = \bar{x} + \frac{h}{3} \times \frac{P}{W} = 6.04\,m.$

$\rightarrow$ eccentricity $= e = z - \frac{b}{2} = 6.04 - \frac{8}{2} = 2.04\,m.$

$P_{max} = 696.25\ kN/m^2.$

$P_{min} = 146.25\ kN/m^2.$

Department of Civil Engineering, MSRIT Bengaluru
Evaluation Criteria and Scoring Rubric
Term and Academic Year... 2025-26.

Criteria	
Practical Skill (10.)	9
Report/Drafting (10.)	8
Viva Voce (10.)	9
Total (30.)	26
Signature with date	

Experiment No. : 2 Date :

Chi Square test for Goodness of test

Aim: To test the goodness of fit for the given set of data at a specified unit of significance.

Procedure:

1. From the given data or observed frequency is calculated.
2. Find the difference b/w observed and expected frequency.
3. The square value of the difference obtained is calculated.
4. Summation of $(O_1 - E_1)^2$ is termed as chi - square values
5. Considering the level of significance as 5%, we have to compare our result with the standard results.

If $\chi^2 > \chi_\alpha^2 \longrightarrow$ Null Hypothesis is rejected.
If $\chi^2 < \chi_\alpha^2 \longrightarrow$ Null Hypothesis is accepted.

Experiment No. :..... Date :.....

Problems

1. An experiment was conducted to test the efficiency of chloromycetin in checking Typhoid. In a certain hospital chloromycetin was given to 285 out of 392 patients suffering from typhoid the number of typhoid cases were as follows. With the help of chi-Square, test the effectiveness of chloromycetin in checking typhoid.

	Typhoid	No typhoid	Total
Chloromycetin	35	250	285
No - Chloromycetin	50	57	107
Total	85	307	392

→ Null Hypothesis: Chloromycetin has no effect on mortality (death and survival rates are independent).

Alternative hypothesis: chloromycetin affects mortality (dead and survival rates are not independent).

Calculation of expected values:

$$R = \frac{\text{Row total} \times \text{Column total}}{\text{Total}}$$

$$R = \frac{285 \times 55}{392} = 61.79.$$

$$R = \frac{285 \times 307}{392} = 223.3.$$

Experiment No. :..... Date :.....

$$R = \frac{107 \times 85}{392} = 23.2.$$

$$R = \frac{107 \times 307}{392} = 53.3.$$

Observed	Expected	$\left[\frac{O-E}{E}\right]^2$
35	61.8	11.62
250	223.2	3.22
50	23.20	30.95
57	83.3	8.37
	Total	54.36

Chi calculated = 54.36.
Chi square tabulated = 3.841.

Degree of freedom = 1
Significance = 3%. $\therefore$ 34.36 > 3.841.

Conclusion: Since chisquare calculated is greater than the chi square tabulated subject the null hypothesis. There is no significant evidence to ~~conclu~~ conclude that chloromycetin affects typhoid mortality.

1. An experiment was conducted to test the efficacy of chloromycetin in checking typhoid. In a certain hospital chloromycetin was given to 285 out of the 392 patients suffering from typhoid. The number of typhoid cases were as follows. With the help of chi square, test the effectiveness of chloromycetin in checking typhoid.

	Typhoid	No Typho	Total
Chloromyc	35	250	285
No Chloror	50	57	107
Total	85	307	392

Answer

Null hypothesis	Chloromycetin has no effect on mortality (death and survival rates are independent
Alternative hypothesis	Chloromycetin affects mortality (death and survival rates are not independent of

Observed	Expected	[(O-E)^2]/E
35	61.80	11.62
250	223.20	3.22
50	23.20	30.95
57	83.80	8.57
		54.36

Chi calcula	54.36
Chi Square	3.841
Degree of f	1
Significanc	5%

Conclusion: Since Chi square calculated is greater than the Chi square tabulated we reject the null hypothesis. There is no significant evidence to conclude that chloromycetin affects typhoid mortality

Experiment No. :..... Date :.....

2 On the basis of information given ~~below~~ below about the treatment of 200 patients suffering from a disease, state whether the new treatment is comparitively superior to the conventional treatment.

	No. of Patients		
Treatment	Favourable response	No response	
New	60	20	80
Conventional	70	50	120
Total	130	70	200

→ Null hypothesis: Security of accidents in independent of the city.

Alternative hypothesis: Security of accidents depends on the city.

Calculation of expected values:

$$R = \frac{\text{Row total} \times \text{Column total}}{\text{Total}}$$

$$R = \frac{80 \times 130}{200} = 52.$$

$$R = \frac{80 \times 70}{200} = 28.$$

$$R = \frac{120 \times 130}{200} = 78.$$

$$R = \frac{120 \times 70}{100} = 42.$$

Experiment No. :..... Date :.....

Observed	Expected	$\frac{[O-E]^2}{E}$
62	52	1.23
20	28	2.29
70	78	0.89
50	42	1.52
	Total	3.86

Chi square calculated = 5.34.
Chi square tabulated = 3.841.
Degree of freedom = 1.
Significance = 5%. $\therefore 5.86 > 3.341$.

Conclusion : We reject the null hypothesis since there is a significance difference between the two treatment the new treatment is comparitively superior to the conventional treatment.

2. On the basis of information given below about the treatment of 200 patients suffering from a disease, state whether the new treatment is comparitively superior to the conventional treatment.

	No.of.Patients	
Treatment	Favourable response	No response
New	60	20
Conventional	70	50

For drawing your inference, use the value of chi square for 1d.o.f at the 5% level of significance.

ANSWER

	No.of.Patients		
Treatment	Favourable response	No response	
New	60	20	80
Conventional	70	50	120
TOTAL	130	70	200

Null hypothesis	Severity of accidents in independent of the city.
Alternative hypothesis	Severity of accidents depends on the city.

Observed	Expected	[(O-E)^2]/E
60	52.00	1.23
20	28.00	2.29
70	78.00	0.82
50	42.00	1.52
	TOTAL	5.86

Chi calculated =	5.86
Chi Square tabulated	3.841
Degree of freedom =	1
Significance =	5%

Conclusion: We reject the null hypothesis since there is a significance difference between the two treatments the new treatment is comparitively superior to the conventional treatment.

Experiment No. :..... Date :.....

3). The following information is obtained concerning an investigation of 50 ordinary shops of small size:-

	In towns	In villages	Total
Run by men	17	18	35
Run by women	3	12	15
Total	20	30	50

Can it be inferred that shops run by women are relatively more in villages than in towns? Use Chi Square.

→ Null hypothesis: Employment status among women is independent of location / village or towns.

Alternative hypothesis: Employment status among women is independent of location (village or town)

$$R = \frac{\text{Row total} \times \text{column total}}{\text{Total}}$$

$$R = \frac{35 \times 20}{50} = 14 \longrightarrow 17.$$

$$R = \frac{35 \times 30}{50} = 9 \longrightarrow 18.$$

$$R = \frac{15 \times 20}{50} = 6 \longrightarrow 3.$$

$$R = \frac{15 \times 30}{50} = 9 \longrightarrow 12.$$

3. The following information is obtained concerning an investigation of 50 ordinary shops of small size:

	In towns	In villages	Total
Run by men	17	18	35
Run by women	3	12	15
Total	20	30	50

Can it be inferred that shops run by women are relatively more in villages than in towns? Use Chi square test.

ANSWER

Null hypothesis: Employment status among women is independent of location (village or town).

Alternative hypothesis: Employment status among women is independent of location (village or town).

Observed	Expected	[(O-E)^2]/E
17	14.00	0.64
18	9.00	9.00
3	6.00	1.50
12	9.00	1.00
	TOTAL	12.14

Chi Square calculated =	12.14
Chi Square tabulated	3.841
Degree of freedom =	1
Significance =	5%

Decision and Interpretation: (i)The chi calculated value is greater than the chi square tabulated.
Hence we reject the null hypothesis. (ii)

Conclusion: There is no statistically significant evidence to conclude that women are likely to be employed in villages than in towns.

Experiment No. :..... Date :.....

Observed	Expected	$\frac{[(O-E)]^2}{E}$
17	14	0.64
18	9	4.00
3	6	1.50
12	9	1
TOTAL		12.14.

Chi square calculated = 12.14.
Chi square tabulated = 3.841.
Degree of freedom = 1.
Significance = 3%.

* Decision and Interpretation:

i) The chi calculated value is greater than the chi square tabulated.
ii) Hence we reject the null hypothesis.

Conclusion: There is no statistically significant evidence to conclude that women are likely to be employed in village than in towns.

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Evaluation Criteria and Scoring Rubric
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Criteria	
Practical Skill (10)	8
Report/Drafting (10)	8
Viva Voce (10)	8
Total (30)	24
Signature with date	

Experiment No. : 3. Date :

Use of STAAD for Analysis of Propped Cantilever, fixed beams, continuous beam

Aim: To analyze the different beam sections and supports using STAAD PRO.

Procedure:

1) Open STAAD Pro and create a New project. Set the working units (eg. KN-m).

2) Create the structure geometry by:
   - Defining nodes at required beam span points.
   - Connecting the nodes using Beam Members.

3) Assign material properties such as:-
   - Grade of concrete or type of steel.
   - Modulus of elasticity and Density (default values can be used from STAAD Library).

4) Assign Cross-section properties to the beams by selecting.
   - Rectangular section (for RCC Beams)
   - Standard rolled steel sections.
     (ISMB / ISHB / etc. for steel beams)

Experiment No. :..... Date :.....

5) Define supports at the required node locations.
- Fixed support to restrict all members.
- Pinned support to restrict translations only.
- Roller support to allow horizontal movement.
- Apply the appropriate support type based on the structural condition.

6) Assign member and releases are needed to create hinged beam ends or continuous Beam Behaviour.

7) Apply loads on the structure.
- Use self weight Command for dead load.
- Apply UDL, point load, or moment as required on beam members.
- Define load cases and load combinations (DL+LL).

8) Click analysis /Run Analysis to perform the structural analysis.

9) Check for errors and warnings in the analysis output and correct if necessary.

10) Go to post processing mode to view
- Shear Force Diagram (SFD).
- Bending Moment Diagram (BMD).
- Support Reactions.
- Beam deflections.

Experiment No. :..... Date :.....

11) If required, use design module (RCC or steel) to obtain reinforcement details or member adequacy.

12) Finally save the model and generate report for documentation.

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Criteria	
Practical Skill (10)	9
Report/Drafting (10)	8
Viva Voce (10)	9
Total (30)	26
Signature with date	M

Experiment No. : 4.

Date :

Use of STAAD Pro for Analysis of Truss

Aim: To analyze the different types of Trusses.

Procedure:

1. Open STAAD Pro and create a new project and set the working units (KN-m or N-mm).
2. Create nodes at the required joint locations of the truss (Top chord, bottom chord, supports etc).
3. Connect the nodes using members to form the truss shape.
4. Assign material properties (steel grade or aluminium as reqd.)
5. Assign member cross-section properties by selecting
   - Angle section (ISA)
   - channels.
6. Define supports at the end joints.
   - One end pinned.
   - Other end rolled.
7. Apply loads on the truss:
   - Nodal loads on top or bottom joints.
   - Member load converted to equivalent nodal loads for roof trusses.
8. Define load cases and load combinations.
9. Click analysis / Run analysis to perform the structural analysis.

Experiment No. :..... Date :.....

10. Check analysis output for errors and confirm structure stability.
11. View results in Post processing mode:
    - ~~Axi~~ Axial forces in members (tension/ compression)
    - Support reactions.
    - Deflection at joints.
12. If required, use steel design module to check member capacity and section safety.
13. Save the model and generate report for documentation.

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Criteria	
Practical Skill (10)	9
Report Drafting (10)	8
Viva Voce (10)	9
Total (30)	26
Signature with date	M

Experiment No. : 5. Date :

~~Use~~ Use of STAAD Pro for analysis of Portal Frames

Aim: To analyze the portal frames using STADD Pro.

Procedure:

~~1. Start~~

1. Start STAAD Pro :→ Open STAAD Pro and create a new project.
2. Go to geometry → Add Beam.
   - Use the grid system to draw the portal frame.
3. ~~Ass~~ Assign supports:
   - Select the bottom nodes and assign fixed or pinned supports as per the frame condition.
   - Use General → Support → create → fixed/pinned → Assign to selected nodes.
4. Assign material and properties
   - Define material : concrete or steel.
   - Assign member properties like cross section dimensions.
5. Apply loads:
   - Go to load and definition → create New load case.
   - Add D.L , L.L and wind load as required
6. Define load combinations.
   - Use load → Auto load combination or define manually.

Experiment No. :..... Date :.....

7. Analysis specification :
- Go to analysis → Define commands → Perform analysis.
- Add Command → Print supports reactions, print member forces.

8. Run analysis :
- Click run analysis.
- Check the output file for errors or warnings.

9. View results :
- Go to post processing mode.
- View B.M.D, S.F.D and deflection.
- Note values of max. BM, S.F and deflection.

10. Interpretation :
- Observe the deflected shape and bending moment pattern.

M

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Criteria	
Practical Skill (10)	9
Report/Drafting (10)	8
Viva Voce (10)	8
Total (30)	25
Signature with date	M

Experiment No. :..... Date :.....

Estimation of Quantities of a structure using Excel

Aim: To calculate the quantities of a structures using excel.

Procedure:

1. Open excel sheet ⟶ New file.
2. Create column headings.
   - Enter heading such as SL No., Item of works, length, No., breadth, height, quality etc.
3. Enter estimate components.
   - Lost off all structural items like, Earthwork, PCC, SSM, BBM, RCC, Plastering etc.
4. Enter dimensions.
   - Enter the respective height, no., length, breadth of the components for each item of works.
5. Calculate the quantity.
   - In the quantity column, use excel formula. Multiply the No., L, B, D and enter.

   ⇒ L × B × D × No. ⇒ Quantity (m^3).
6. Use Auto file for ~~mult~~ multiple items.
   - Drag the formula down to calculate quantity of all item of work.

Experiment No. : 7 Date :

Use of STAAD Packages for Analysis of 3D Rigid frame, and Multistory frame structures

Aim: To analyse 3D rigid frame & multistory frame structures.

Procedure:

1. Start a New Model:
   - Open STAAD PRO → New Project → space structure.
   - Set units.

2. Create the structure:
   - Go to structure wizards → Model type → frame mode → Bay frame.
   - Provide the required measurements.

3. Assign properties:
   - Go to properties → define
   - Select concrete / steel section (rectangular, circular, ISMB, etc).
   - Assign those sections to Beams & columns.

4. Apply supports:
   - Go to supports → Create.
   - Choose fixed or pinned support.
   - Select base nodes → Assign support.

Experiment No. :..... Date :.....

5. Define loads:
- Go to load & definations.
- Create load case 1: dead load.
- Create wind / siesmic loads.
- Assign loads.
- Self weight = ON (eg. y direction = -1).
- UDL on Beams (dead / Live load).
- Floor loads / Nodal Lateral loads if needed.

6. Create load combinations:
- Go to load combinations.
- Add standard combos like: 1.5 (DL + LL)
  1.2 (DL + LL - WL)

7. Run Analysis:
- Go to analysis → Run Analysis.
- Check for errors / warnings in the output file.

8. View Results:
- Go to post - processing mode.
- View deflection shape.
- Check bending moment, shear, axial force.
- Check support reactions.

9. Design (optional):
- Go to design → concrete (steel design)
- Select code (IS456 / IS800 etc)
- Assign design parameters.

Experiment No. : 8. Date :

Analysis design of a whole structure using STAAD Pro

Aim: To analyze & design a whole structure (G+3) using stadd pro.

Procedure:

~~1. Open - STAAD Pro~~
~~File → New Project → file name → location → Analog~~
~~Assign loads → Self weight → UDL on beams (DL/LL)~~
~~Floor loads / Nodal lateral load is needed.~~

~~2. Create load combinati~~

1. Start a New Model:
   - Open STAAD PRO → New Project → Space structure
   - Set units.

2. Create the structure:
   - Go to structure wizards → Model type → Frame Model → Bay frame
   - Provide the required measurements.

3. Assign properties:
   - Go to properties → Define.
   - Select ~~th~~ concrete / steel section (rectangular, circular, ISMB, etc.

Experiment No. :..... Date :.....

- Assign these sections to beams & columns.

4. Apply ~~Bs~~ supports:
- Go to supports → Create.
- choose fixed or pinned support.
- ~~Se~~ select base Nodes → Assign support.

5. Define loads:
- Go to load & definitions
- Create load case 1: dead load
- Create wind / seismic loads.
- Assign loads
- Self weight = ON (e.g. y direction = −1)
- UDL on beams (DL / LL)
- Floor loads / Nodal lateral loads if needed.

6. Create load combinations:
- Go to load combinations.
- Add standard combos like : 1.5 (DL + LL)
  1.2 (DL + LL . WL)

7. Run Analysis:
- Go to Analysis → Run analysis.
- Check for errors / warnings in the output file.

8. View results:
- Go to post-processing mode.
- View deflection shape.

Experiment No. :..... Date :.....

9. Design (optional):
- Go to design → concrete / steel design.
- Select code (IS456 / IS800 etc).
- Assign design parameters.

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Criteria	
Practical Skill (10)	8
Report/Drafting (10)	8
Viva Voce (10)	8
Total (30)	24
Signature with date	

Experiment No. : 9 Date :

Preparation of Schedule for a project by using MS Project

Aim: To prepare a schedule for new project.

Procedure:

1. Open New MS project file.
2. Go to project → project information → schedule form → click project → start date & project end date → give saturday as working day, give public endings if necessary.
3. Go to standards → OK → change working time then set the day or month or week or year which is required.
4. Go to details → Non working → Start & end by dates → OK.
5. Go to change work time → options → schedule → give working hours per day, week & month.
6. Go to advanced → default standard rate is changed to per day.
7. Click on resource → assign resource (cement, aggregate, etc)
8. Add all required task → assign start & end date (time) required dates
9. After the completed task. Select main work & format, click on insert task for giving works under the main task.

Experiment No. :..... Date :.....

10. Format → Gantt chart wizard → critical path → next → resources → date & time → next → format → exit.

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Criteria	
Practical Skill (...10...)	8
Report/Drafting (..10..)	8
Viva Voce (..10..)	8
Total (..30..)	24
Signature with date	

Experiment No. : 10 Date :

Regression Analysis

Definition: It is a set of statistical processes for estimating the relationship b/w variables.

Aim: To explain the variation in dependent variable based on variation in one or more independent variables.

Procedure:

1. Enter the known values of independent variables and determine the dependent variables.
2. Take the logarthmic values to see the variations in it.
3. Go to data → Data analysis → select regression analysis → select labels, residuals and normal probability plots.
4. Enter dependent variable values as Y range and independent variable values as X range and click on OK.
5. From the results, identify the constants and form an equation relating the dependent & independent variables.
6. Plot a scatter chart and right click on the values to add a linear trendline.
7. Enable the equation and R^2 value

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Report/Drafting (10)	8
Viva Voce (10)	8
Total (30)	24
Signature with date	