IQRA NATIONAL UNIVERSITY, PESHAWAR

DEPARTMENT OF CIVIL ENGINEERING

Id# 7722 name MUSHTAQ AHMAD section c

Quiz/Assignment

Subject: Hydraulic Structures
Instructor: Engr. Adeed Khan
Semester: 8th/Repeaters

Note: Attempt all questions. Draw sketches where necessary. Assume missing data if any.

Qno#01:

Part A)Reservoir:

A *reservoir* ***is a man made lake or larger freshwater body of water many people think of reservoir as lake and night even use the word interchangeable. However the key different is that***

- **A reservoir are artificially and made by human, while lake are natural occurring bodies of water reservoir is great because they providing a supply of water for when natural occurring bodies of water , like lakes and river run by dry or Aplace where something is keen in stored is called reservoir.**
- ***Bank-side reservoir :***

Direct water supply

The bank side reservoir that are made by diverting water from local river or streams to an existing reservoir, although therir can be applied to many different geological areas, unlike the valley dammed reservoir, which required a valley, diverting water from a river can create problems. Bank-side reservoir are used to provide raw water feed to a water treatment plant which delivered drinking water through water main.

Why:

Because the bank side reservoir which not required a valley unlike the

valley dam reservoir for diverting water from river it can migh to create the problem. And also the bank side reservoir this can be applied to many different geological areas unlike the valley dam reservoir. Unlike service reservoir might farmilities with the larger water towers required in the country side
The bank side reservoir is encnomical reservoir unlike the valley dam reservoir and service dam reservoir.

- ……..
- ***Qno01***
- ***Part B)gravity dam Will suggest in a hilly areas:***
- *Design from concrete and masonry stone.*
  Suited to widevalleys,provide that excavation to rock is less than c.5m limited weathering of rock acceptable.
- *Check discontinuities in rock with regard to sliding.*
- *Moderate contact stresses. Required imported cement.*
- *Gravity dam primarily using the weight of the material alone to resists the horizantal pressure of water pursuing against it.*
- *Gravity dam is designed so that each section of the dam is stable and independent of any other dam of the section.*
- *The gravity dam bearing strength is limited to allowable resulanforce, influence the over all stability.*
- *The grvity dam the can might tolerate minor over topping flowd without damages .*
- ***Why?***
- *Because the gravity dam bearing strength is limited to allowable resulanforce.*
- *And also designed in a hilly areas for most chances flooded and sliding.*
- *It could be tolerate the over topping flows without damages.*
- *The population is down to chances of flood the gravity dam bearing strength might high the can resists resulanforce against it*
- *Also the mateial encnomical over here to production and avilibility is more .*
- *It could might strong about earthquakes it can resists horizontal force of water pursuing against it.*

……..
Qno02?
List down different types of spillways:

- *Straight drop spillway.*
- *Ogee spillway.*
- *Shaft spillway.*
- *Chute spillway.*
- *Side channel spillway.*
- *Siphon spillway.*
- *Labyrinth spillway.*
- ***Efficient spillway conditions freezing point of water less10degree:***
-

Ogee shaped spillway:

An Ogee shaped spillway is the most commonly used spillway.
It is widely used with gravity dam, Arch dam, and buttress dams.
Several rock fill and earth fill dams are also provided with this types pf spillway as a superstructure.

An ogee spillway is look lile English later “s”
The upper part of the spillway surface matches closely to the lower napped of a ventilated spillway.

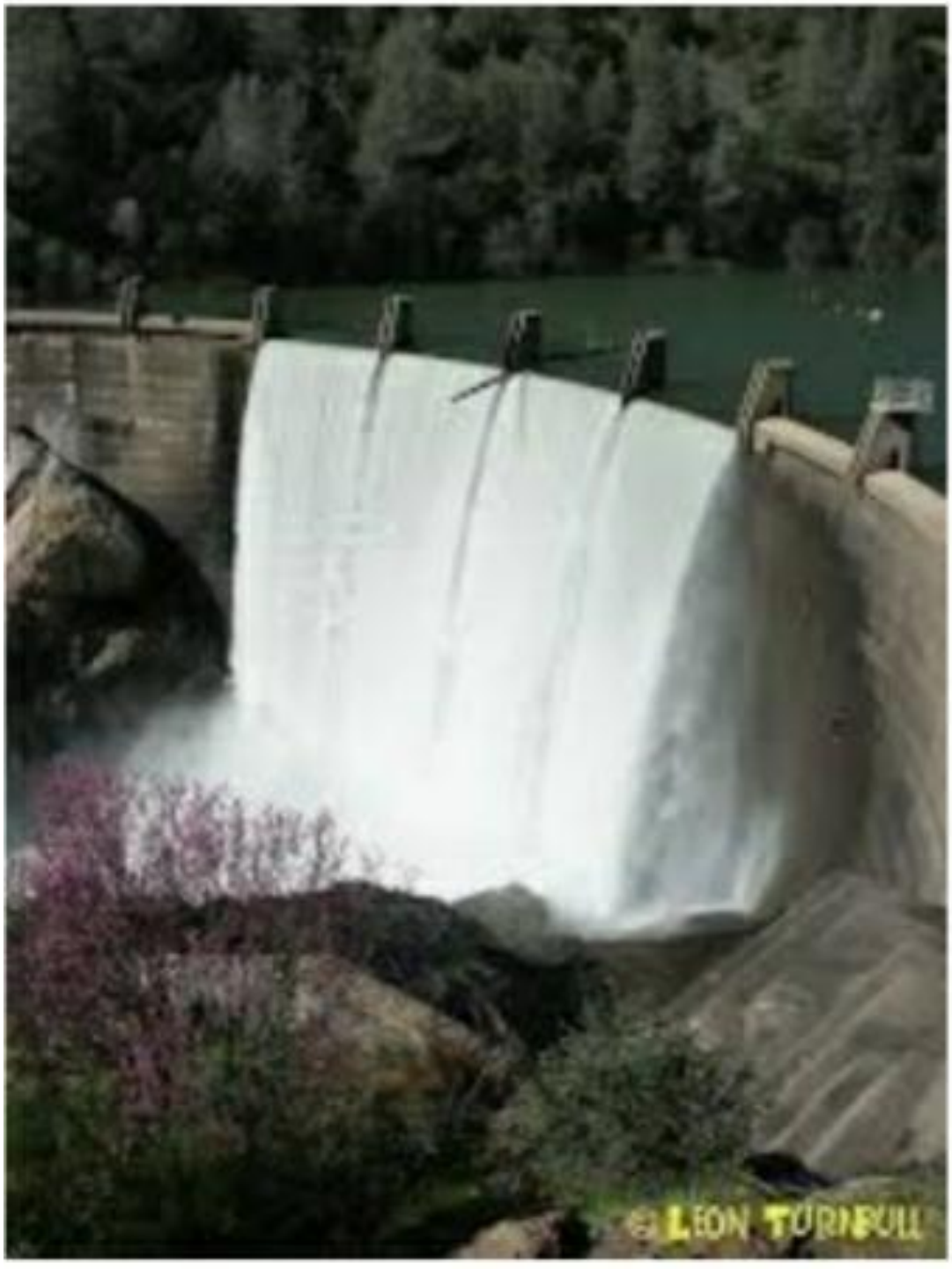


Figure B.7. Ogee weir at North...

researchgate.net

Ogee or overflow spillway

- The Ogee spillway is generally provided in rigid dams and forms a part of the main dam itself if sufficient length is available.
- The overflow type spillway has a crest shaped in the form of an ogee or S-shape.
- The upper curve at the crest may be made either larger or sharper than the nappe.

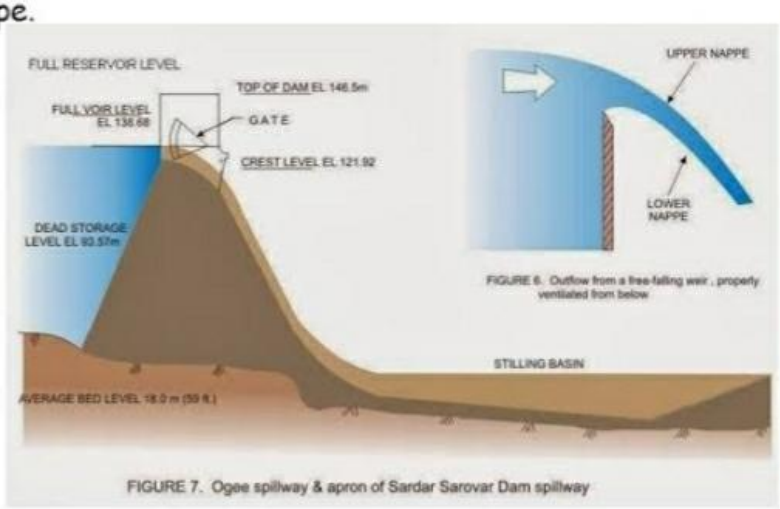


FIGURE 7. Ogee spillway & apron of Sardar Sarovar Dam spillway

Conditions in winter below 10 degree centigrade and

spillway should fulfil the following requirements.

The spillway should fulfil the efficient in winter.

Th spillway should have sufficient lengths.

The location of the spillway should have provide safe disposal of water without toe erosion

Spillway should be Hydraulically and structure sufficient.

Usually spillway should be accomplished by an energy dissipation by an energy dissipation word on its downstream aide.

why:because

it is the mostly common used but its generally provide in regid dams itself if sufficient lengths is available. Because this is suited for winter where freezing point less than 10 degree centigrade in over flow from the toop surface

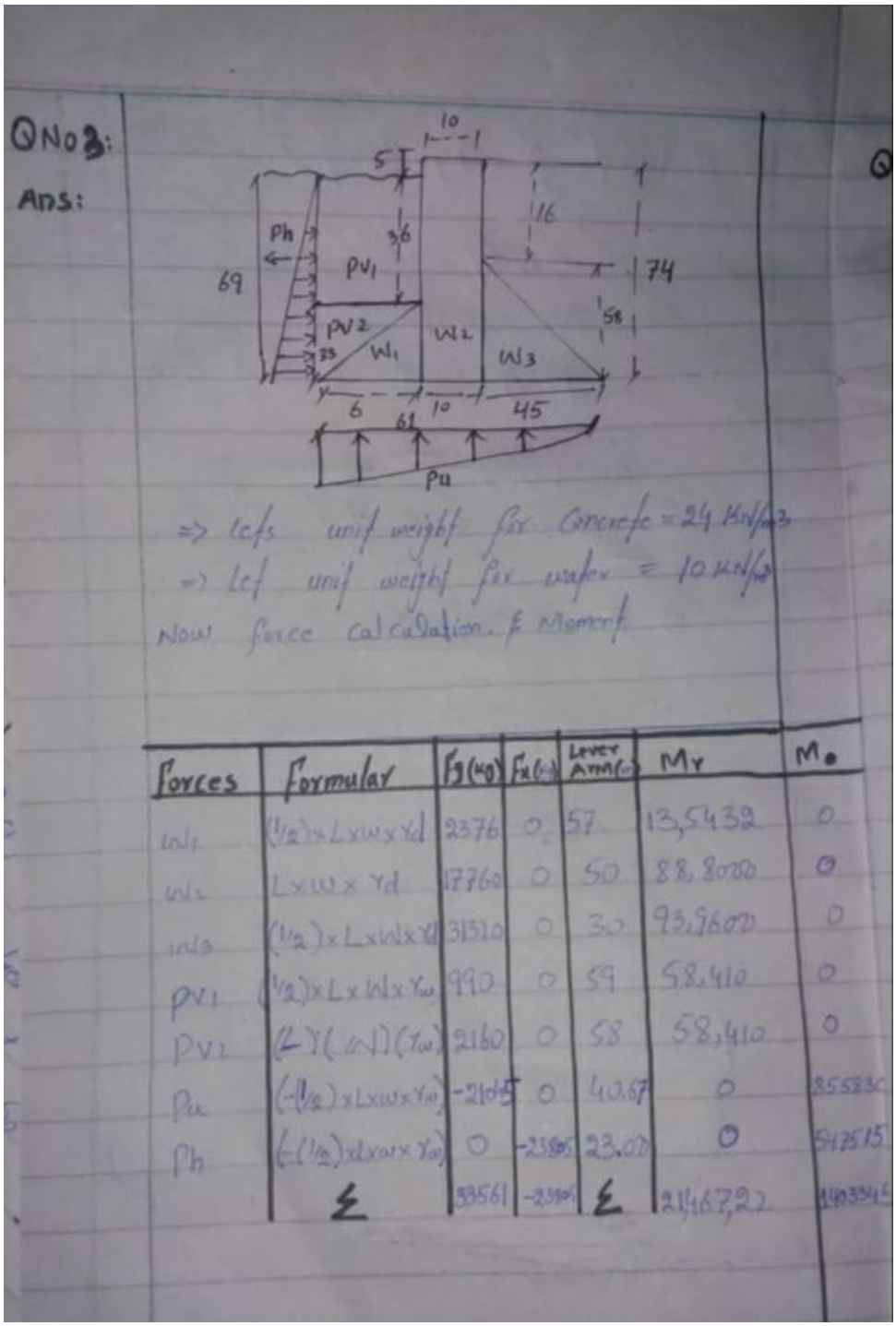
- *It also can be climateed that the change in geometry of ogee spillway from upstream quadrant to the downstream equation of spillway,*
- *Depends on designed head(HD-) it is required to verify the accuracy of meshing.*
- *The correctness of the choice of turbulence model and ensure that they have no effect on the resulting.*

An ogee the vantiled sheet of water falling freely from a sharp creasted weir .downwards stream and upstream prpfile of ogee spillway.

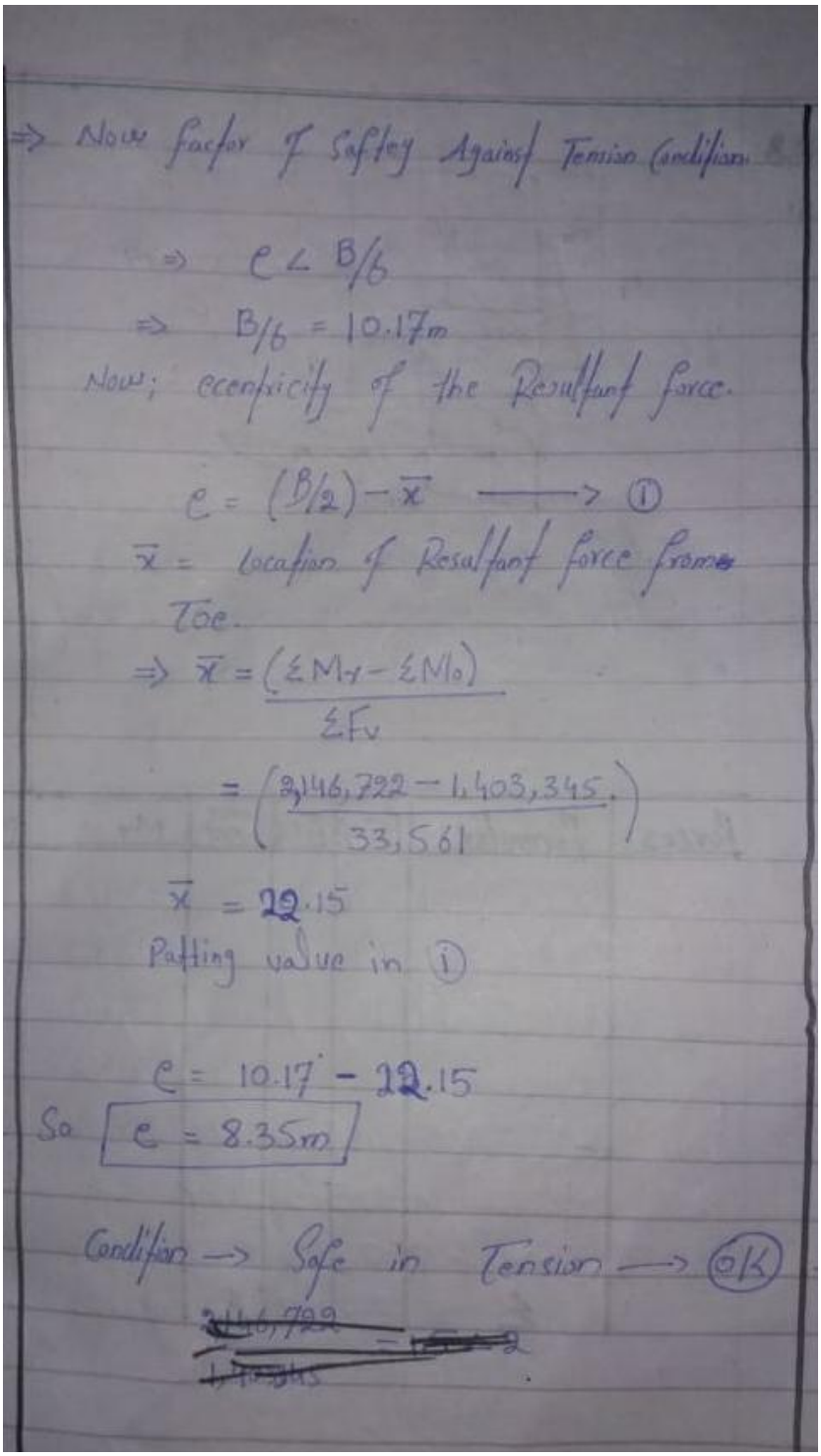
Qno03:
Givendata

Numerical

Page 1.



Forces	Formulay	Fy(kg)	Fx(kg)	Lever Arm(m)	Mr	Mo
W1	(1/2)×L×w×γd	2376	0	57	13,5432	0
W2	L×w×γd	17760	0	50	88,8000	0
W3	(1/2)×L×w×γd	31320	0	30	93,9600	0
Pv1	(1/2)×L×w×γw	990	0	59	58,410	0
Pv2	(L)(w)(γw)	2160	0	58	58,410	0
Pu	(-1/2)×L×w×γw	-2105	0	40.67	0	855836
Ph	(-1/2)×L×w×γw	0	-2386	23.00	0	547515
	Σ	33561	-2386	Σ	21,467,22	1403345



⇒ Now factor of Safety Against Tension Condition.

⇒ $e < B/6$

⇒ $B/6 = 10.17m$

Now; eccentricity of the Resultant force.

$$e = (B/2) - \bar{x} \longrightarrow (1)$$

$\bar{x}$ = Location of Resultant force from Toe.

$$\Rightarrow \bar{x} = \frac{(\Sigma M_r - \Sigma M_o)}{\Sigma F_v}$$

$$= \left(\frac{3,146,722 - 1,403,345}{33,561}\right)$$

$$\bar{x} = 22.15$$

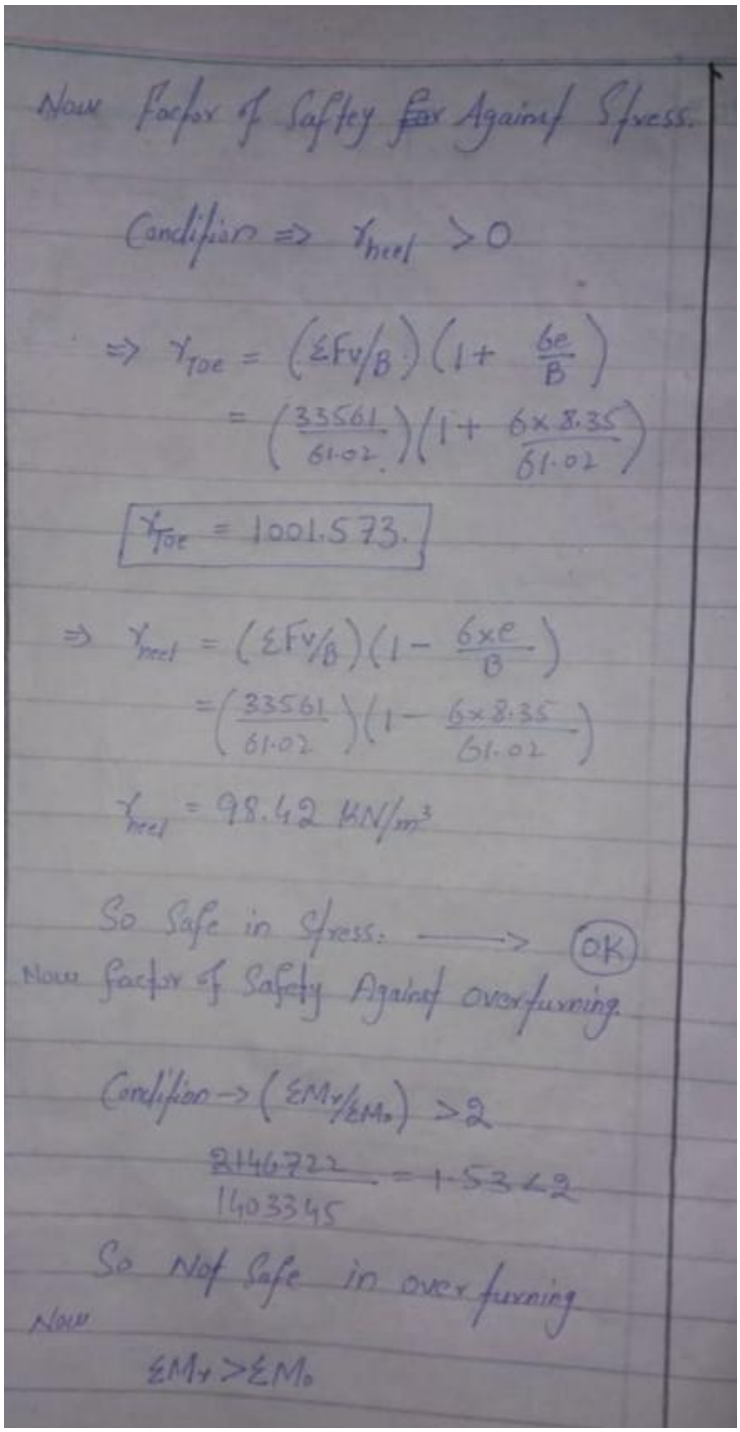
Putting value in (1)

$$e = 10.17 - 22.15$$

So $\boxed{e = 8.35m}$

Condition → Safe in Tension → (OK)

~~3146,722 = [illegible]~~



Now Factor of Safety for Against Stress.

Condition $\Rightarrow \gamma_{heel} > 0$

$$\Rightarrow \gamma_{Toe} = \left(\frac{\Sigma F_v}{B}\right)\left(1 + \frac{6e}{B}\right)$$

$$= \left(\frac{33561}{61.02}\right)\left(1 + \frac{6 \times 8.35}{61.02}\right)$$

$$\gamma_{Toe} = 1001.573.$$

$$\Rightarrow \gamma_{heel} = \left(\frac{\Sigma F_v}{B}\right)\left(1 - \frac{6 \times e}{B}\right)$$

$$= \left(\frac{33561}{61.02}\right)\left(1 - \frac{6 \times 8.35}{61.02}\right)$$

$$\gamma_{heel} = 98.42 \text{ KN/m}^3$$

So Safe in Stress. ——> (OK)

Now factor of Safety Against overturning.

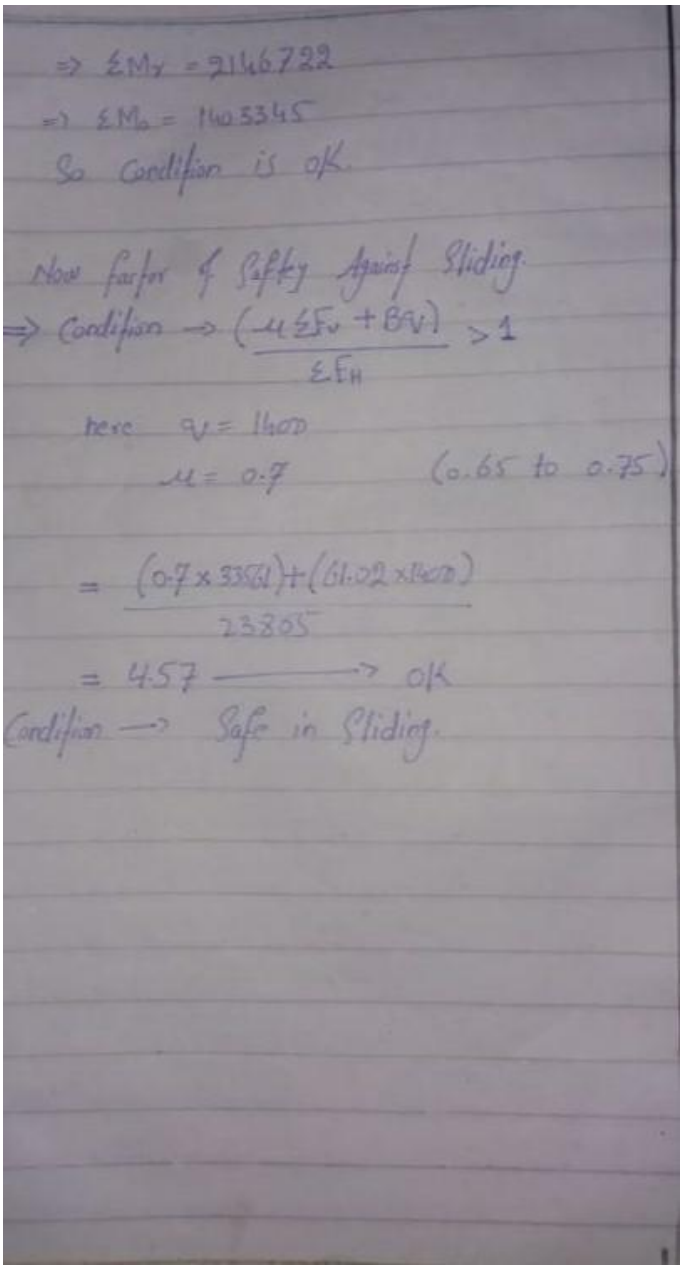
Condition -> $(\Sigma M_r / \Sigma M_o) > 2$

$$\frac{2146722}{1403345} = 1.53 < 2$$

So Not Safe in overturning

Now

$\Sigma M_r > \Sigma M_o$


⇒ ΣMy = 2146722
⇒ ΣMb = 1403345
So Condition is ok.
Now factor of Safty Against Sliding
⇒ Condition → (μΣFv + BAv) / ΣFH > 1
here Av = 1600
μ = 0.7 (0.65 to 0.75)
= (0.7 x 33561) + (61.02 x 1600) / 23805
= 4.57 ——→ ok
Condition → Safe in Sliding.