**Question 1**

**Determine the following values from the diagram?**

**Answer:**

1. Design Doubly reinforced beam and , and appropriate diagram

**Solution:**

C=3.67inch

Ф=0.9

Answer 1 (B)

solution:

1 factored load :

Mu=1.2(125)+1.6(410)

Mu=806ft-k

1. Nominal Moment “Mn”

Mn=

Mn=895.55ft-k

Ymax (from append)= 0.0181

Mu1=912\*Фb=912\*0.9\*20(30)(30)

Mu1=12321.20ft-k

Mn1=

Mn2=mn-mn1=895.55-1368

Mn2=472.45ft-k

1. Theoretical As’ required

As’=3.49

Try 4#9

As2= 4\*60/60

As2=4

As=10.86+4

As=14.86

Asumming Fs=Fy

C=11.80in

€s’=0.002

€t=0.004

Ф=0.96

As2=3.49

As1=11.37

Mn1=As1Fy(d-a/2)

Mn1=1420.68ft-k

Mn2=471.15ft-k

Mn=1891.83ft-kj

ФMn=0.88\*1891.83

ФMn=1664.8 > Mu OK

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(2)

Ф=0.9

**Question 2:**

Design a short square column…………………………………………………...??

**Solution:**

Assume the column will have an average compression stress =

Try 16-in \* 16-in column (

¥=

**Question 3:**

***Given data:***

*Dead load =125k*

*60000psi*

*3000psi*

*1259psi*

*Solution:*

*Step:1*

*Total load =125+160=283k*

* Considering space floating
* Size of floating =

=1.53\*1.53=2.37

***Step2L:***

***Net upoward face (p)***

*Step3 :*

*Bending moment :*

*W=P\*bF=102.56\*1.53*

*W=156.91bending moment crtical factor =BM UT x-x==*

***BM=19.61KNm***

***Step4:***

Mu ***lim=0.***149Fccbd

19.61\* =0.149\*20+1530

d=67.52

provide the depth d 2 to 2.5 times higher become sharing criteria

d=67.52\*2.5

d=168mm

D=d +d/2+Ф+clear cover

D=168+10/2+10+50

D=233mm

**Step 5:**

Reinforcement:

=Ast=8.73

Ast=8.73

Provide 30no’s 20mm Ф B/c

Step 6:

Check for cracking

**Step 7:**

One-way shear critical section taken at distance d from face to column

Vu =Sf on hatch Area

=P\* hatched Area

=102\*1.53\*(0.650)

Vu=101.43KN

**Step 8:**

Two-way shear

Bo=4(630)

Vu=Pa hatched Area

Vu=102.56\*(1.53-0.92) =156.91KN

**Step 9:**

Ld= 906nm

Actually Ld provided for column face

Ld provided >Ld required =>ok

**Step10:**

Load transfer column to footing

Allowing bearing stress =0.45fck

C=0.49k20

Allowing bearing force=9\* Area of column

= 9\*400\*400

=144KN

Factored load on column greater then allowable load

Question 4:

design doubly beam for ……………………………………………..?