Summer Fellowship Report

On

Osdag

Submitted by

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&

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Acknowledgment

I would like to thank the FOSSEE project from IIT Bombay for giving me an opportunity to do internship with Osdag. The internship opportunity was a great chance for me to learn and develop myself professionally. It helped me to enhance my knowledge in structural steel design and testing of software. I feel grateful to have met so many wonderful people and professionals who guided me through this internship period.

I would like to specially acknowledge Prof. Siddhartha Ghosh with my deepest gratitude who in spite of being busy with his duties, took time out to hear, guide and keep me on the correct path and allowing me to carry out my project at their esteemed research lab (SSRR lab).

I would also like to acknowledge the members of the Osdag team; Danish Ansari (Project Research Assistant), Ajmal Babu MS (Project Research Engineer), Dharma Teja Nuli (Project Software Engineer), Reshma Konjari (Project Research Associate), Swathi Manjula (Project Research Associate) for their careful and precious guidance which was extremely valuable for my both theoretical and practical study.

I consider this opportunity as a big milestone in my career development. I shall strive to use the acquired skills and knowledge in the best possible way, and I will continue to work on its improvement, in order to attain desired career objectives.

Contents

Chapter 1

Introduction to Osdag Internship

Osdag internship is provided under the FOSSEE project. FOSSEE project promotes the use of FOSS (Free and Open Source Software) tools to improve quality of education in our country. FOSSEE encourages the use of FOSS tools through various activities to ensure commercial (paid) softwares are replaced by equivalent FOSS tools.

The FOSSEE project is a part of the National Mission on Education through Infrastructure and Communication Technology(ICT), Ministry of Human Resources and Development, Government of India.

Osdag is one such open source software which comes under the FOSSEE project. Osdag internship is provided through FOSSEE project. Any UG/PG/PhD holder can apply for this internship. And the selection will be based on a screening task.

1.1   What is Osdag ?

Osdag is a cross-platform free and open-source software for the design of steel structures, following the Indian standard IS 800:2007. It allows the users to design steel connections, members and systems using a graphical user interface. The interactive GUI provides a 3D visualisation of the designed component and creates images for construction/fabrication drawings.

It is used for solving steel structures problems and to see how the connection will look after practical implementation. There are different modules available in Osdag with various connectivities.

Osdag provides various features such as:

- An interactive window displaying a 3D CAD model, which provides a clear visualisation of the designed component.

- Creation of 3D CAD models that can be imported to generic CAD softwares.
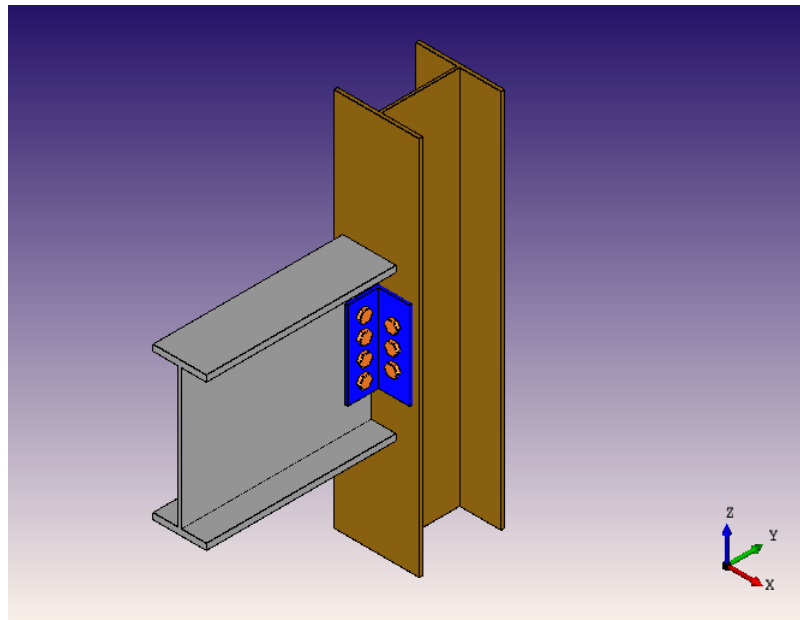
- User-friendly input and output docs, with text-validated fields grouped according to the design flow.
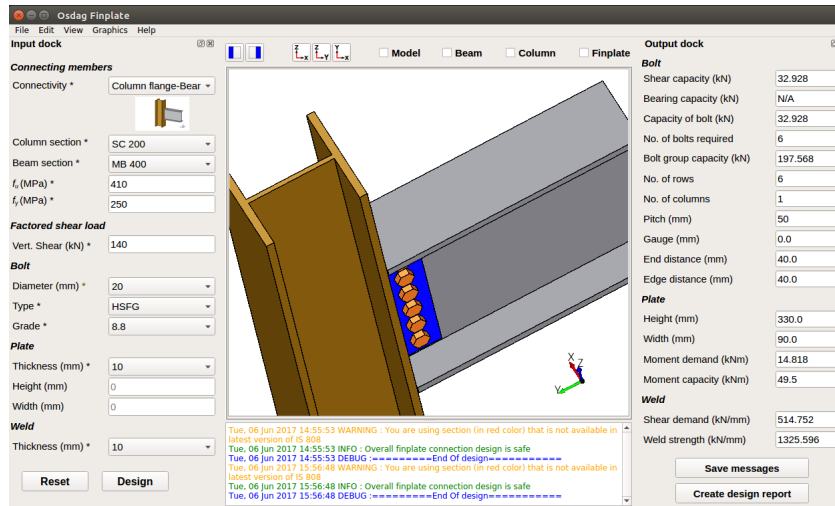
- A text window for message display, that also suggests necessary changes if a trial design is found unsafe.
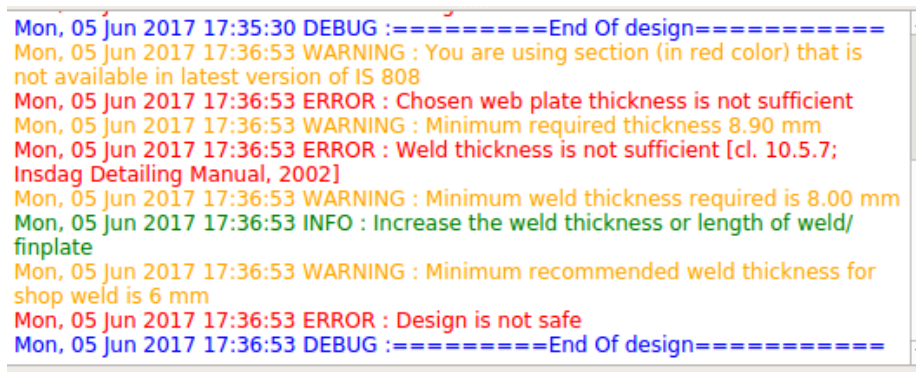
- Creation of a professional design report showing all necessary checks, design calculations as per IS 800:2007, and standard views of the designed component.

- Creation of 2D vector (and raster) images that can be used in a design report or class assignment.

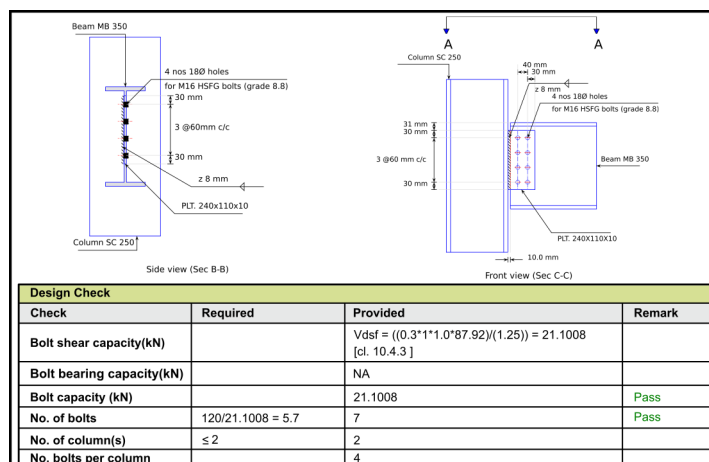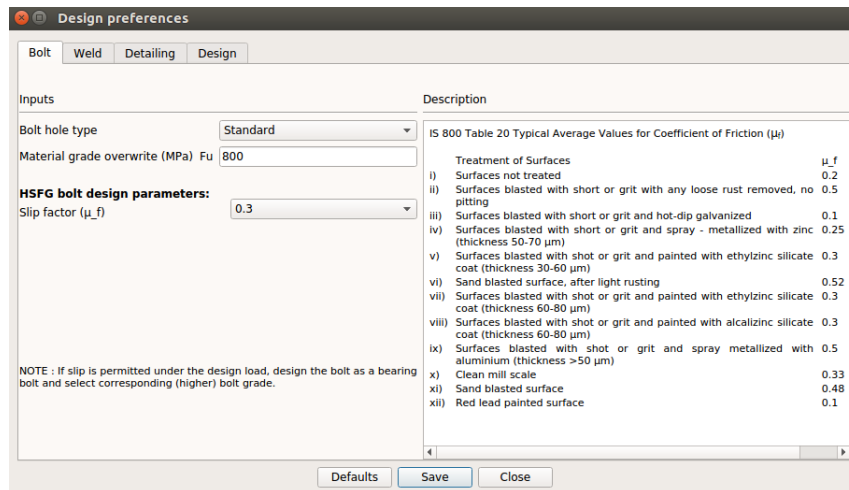- Selection of design preferences, considering different construction and detailing aspects, using a design preference toolbox.

1.2 Who can use ?

Osdag is generally created for industry professionals but it also keep students in mind. As Osdag is funded by MHRD, Osdag team tries to manipulate software in such a way that it can be used by the students during their academics and to give them a better insight look in the subject.

Basically Osdag can be used by anyone starting from novice to professionals. It's simple and sober user interface makes it flexible and attractive than the other softwares. Also there are video tutorials to get started. The video tutorials of Osdag can be accessed here.

Chapter 2

Creation of Design Examples

It is very important to have some pre-accessible design examples for the users so that they can access the functions of the software. The design examples are nothing but the already tested input parameters in the .osi format. The design report of the design examples are also provided to the user in the .pdf format.

Although there were few design examples for each connectivity, there was a need to modify them and to create more elaborate examples.

To make the new design examples with different combinations, I tried the combinations of various f_u and f_y values, some basics of shear and moment concepts and various combinations of design preferences. I also tried the comparison between two different connectivities for the same input values. And taking the above points in consideration I created two sets of sample design examples. Also the .osi and .pdf files of all the above design examples can be accessed from the following link.

Design Examples

2.1 Set 1

2.1.1 Shear Connection

Fin Plate Connection

1. A fin plate connection is to be designed for a beam-beam connectivity for transferring a vertical factored shear load of 180 KN. Here the primary beam is NPB 450x190x92.4 and the secondary beam is MB 350. Try a fin plate of size 210 x 140 x 18 mm. Use M20 friction grip bolts of 8.8 grade. Take Fe 410 grade steel (f_u = 410 MPa & f_y = 250 MPa). The size of the weld is 16 mm. Assume the bolt hole type as standard, weld type as shop weld and type of cut as machine flame-cut. Take slip factor as 0.3.

2. Design a fin plate connection for connecting the flange of column PBP 260X75 and web of the beam MB 300. The vertical factored load, acting at a distance of 0.6 m from the connection creates a moment of 90 kNm. Use M24 friction grip bolts of 8.8 grade. Try 12 mm thick fin plate with weld thickness of 10 mm. Take Fe 440 grade steel (f_u = 440 MPa & f_y = 300 MPa). Assume bolt hole type as standard, weld as shop weld and type of cut as hand flame cut. Assume that the surface of the metal is treated with a blast of sand.

3. Design a fin plate connection for a column web-beam web connectivity for transferring a vertical factored shear load of 250 KN. Take column section as PBP 400x230.9 and beam as NPB 350x250x79.2. Take Fe 490 grade steel (f_u = 490Mpa & f_y = 350Mpa). Use M16 bolts of 8.8 grade for a slip permitted connection. Try 18 mm thick fin plate

with a weld thickness of 16 mm. Assume bolt hole type as oversized, weld type as shop weld and the type of edge as machine-flame cut. The clearance between the beams required is 15 mm.

End Plate Connection

1. An end plate connection is to be designed for a construction along a coastal region for beam-beam connectivity between primary beam MB 400 and secondary beam as NPB 350x170x57.1 to transfer a vertical factored shear force of 150 KN. Use M20 friction grip bolts of grade 8.8. Try 16 mm thick end plate with weld thickness of 8 mm. Take Fe 410 grade steel (f_u = 410 Mpa, f_y = 250 Mpa). The surface of metal is blasted with grit and sprayed metallized with aluminium. Assume bolt hole type as standard, weld type as field weld and type of edge as hand flame cut.

2. Design an end plate connection for a column flange-beam web connectivity between a beam UB 305x102x28 and a column UC 356x406x235 for transferring a vertical (factored) shear force of 165 kN. Find the weld length required if 6 mm thick weld is to be provided. Try plate thickness of 20 mm. Take Fe 540 grade steel (f_u = 540 Mpa & f_y = 390 Mpa). Use M24 bolts of grade 8.8, assuming slip is restricted. Assume bolt hole type as standard, slip factor of 0.5, type of weld as shop weld and edge type as machine flame cut.

3. An end plate connection is to be designed for a column web-beam web connectivity to transfer a vertical factored shear force of 120 KN. The column section is PBP 400x230.9 and beam section is WPB 360x300x83.7. Take Fe 410

grade steel ($f_u = 410$ MPa & $f_y = 250$ MPa). Use M12 bearing bolts of grade 4.8 and plate thickness of 14 mm. Which of the following weld thickness will require more weld length

a) 8 mm

b) 6 mm

Assume bolt hole type as standard and type of weld as field weld & type of edge type as sheared or hand flame cut.

Cleat Angle Connection

1. Design a cleat angle connection for a column flange-beam web connectivity between a beam UB 305x102x25 and a column PBP 400x230.9 for transferring a vertical (factored) shear force of 150 KN. Use M16 bearing bolts of 4.6 grade. Try cleat angle of size 110x110x12 mm. Take Fe 540 grade steel (f_y =540 Mpa, f_u =410 Mpa). Assume bolt hole type as standard, type of edge as hand flame cut and environment as corrosive.

2. Design a cleat angle connection for a column web-beam web connectivity to transfer a vertical factored shear load of 250 KN. Take column section as PBP 360x108.9 and beam section as NPB 330x160x57. Take Fe 440 grade steel ($f_u = 440$ Mpa & $f_y = 300$ Mpa). Take M16 bearing bolts of grade 5.6. Try a cleat section of size 130x130x16 mm. Assume the bolt hole type as oversized and type of edge as machine flame cut and gap between column and beam as 10 mm.

3. Design a cleat angle connection for a beam-beam connectivity to transfer a vertical factored shear load of 400 KN.

Take primary beam as WPB 900x300x291.5 and secondary beam as UB 762x267x147. Take Fe 590 grade steel (f_u = 590 Mpa & f_y = 450 Mpa). Use M30 friction grip bolts of grade 10.9. Try a cleat section of size 200x150x15 mm. Assume the member is exposed to corrosion and the surface of the metal is treated with sand blast after light rusting (refer IS 800-2007 Table-20, cl. 10.4.3 to figure out slip factor). Assume bolt hole type as standard, type of edge as hand flame cut.

Seated Angle Connection

1. A seated angle connection is to be designed for column flange-beam flange connectivity between column HB 400* and beam MB 500 to transfer a vertical factored shear force of 100 KN. Take Fe 410 grade steel (f_u= 410 MPa & f_y = 250 MPa). Try seat angle of size 150x115x12 mm and clip angle of size 110x110x10 mm. Which of the following will give the maximum shear capacity of bolt.
   a) M16, bearing bolts, grade 8.8
   b) M16, friction grip bolts, grade 8.8 (slip factor = 0.3)
   Assume bolt hole type as oversized, type of edge as machine flame cut and gap between column and beam as 5 mm.

2. A seated angle connection is to be designed to transfer a vertical factored shear force of 135 KN. The details of the connection are as follows: Beam NPB 450x190x77.6 Column PBP 320x117.3 M16, bearing bolts of grade 8.8. Seat angle 150x115x16 Top angle 90x90x12 Take Fe 440 grade steel (f_u= 440 MPa & f_y= 300 MPa). Which of the following connection will be economical?

a) Column web-beam flange Assume type of edge as machine-flame cut and environment as corrosive.

b) Column flange-beam flange. Assume type of edge as machine-flame cut and environment as corrosive.

2.1.2 Moment Connection

Cover Plate Connection

1. Design a moment connection using beam-beam connectivity for transferring a factored moment, factored shear force and factored axial force of 120 KN-m, 250 KN, 270 KN respectively. Take beam section as WPB 200x200x88.2. Use M16 HSFG bolts of 8.8 grade and slip factor as 0.48. Take flange splice plate thickness as 24 mm and web splice plate thickness as 16 mm. Assume gap between beams is 10 mm. Take Fe 490 grade steel (f_u = 490 Mpa & f_y = 350 Mpa). Assume bolt hole type as standard and type of edge as machine flame cut.(Design for only outside cover plate)

Extended End Plate

1. Design a bolted extended end plate (both way) connection for a beam NPB 350x170x50.2 for transmitting a factored reversible moment of 100 KNm. Take Fe 410 grade steel (f_y = 250 MPa and f_u = 410 MPa). Use M20 bearing bolts of grade 9.8. Try an end plate 20 mm thick and weld of sizes 8 mm and 6 mm at flange and web respectively. The bearing bolt is non-pre-tensioned and the hole type is oversized. The type of weld is shop weld and the edge type is sheared or hand flame cut.

2. A beam MB 450 is spliced at a certain distance from the support. Design a beam to beam spliced extended (both way) end plate connection subjected to a reversible factored bending moment of 170 KNm. Additionally, the connection is subjected to a factored shear force of 100 KN and an axial force of 40 KN. Use M20 friction grip bolts of 8.8 grade. Try 20 mm thick end plate. The size of the weld at flange is 10 mm and at the web is 8 mm respectively. Take Fe 410 grade steel ($f_y = 250$ MPa and $f_u = 410$ MPa). Assume that the bolt is pre-tensioned, hole type is standard and slip factor is 0.3. The type of weld is shop weld and the edge type is sheared or hand flame cut.

2.2 Set 2

2.2.1 Shear Connection

Fin Plate Connection

1. A Fin plate connection is to be designed for a beam - beam connectivity, here primary beam is taken as UB 457x152x82 and secondary beam as NPB 300x150x42.2 for transferring an inclined factored load of 60 KN , the inclined load is making an angle of 60 degrees with the beam. Take Fe 440 grade of steel ($f_u = 440$ Mpa and $f_y = 300$ Mpa). Use M24 friction grip bolts of grade 8.8. Take pate thickness as 12 mm and weld thickness as 10 mm. Assume bolt hole type as standard, type of edges as rolled and weld as shop weld.

2. Design a fin plate connection for a column web - beam web connectivity between a beam NPB 300x165x53.4 and col-

umn PBP 300x88 for transferring a vertical factored shear force of 130 KN. Use M16 friction bolts of 8.8 grade. Try 14 mm thick fin plate with weld thickness of 10 mm. Take Fe 490 grade steel ($f_y = 330$ Mpa & $f_u = 490$ Mpa). Assume bolt hole type as oversized, type of weld as shop weld & edge as hand flame cut and environment as corrosive.

3. A column flange - beam web connection is to be provided by using column section as PBP 400x212.5 and beam section as UB 305x165x40 for transferring a vertical factored load of 100 KN. Use M24 friction grip bolts of 10.9 grade and plate thickness of 12 mm and weld thickness of 8 mm. Take Fe 440 grade steel ($f_u = 440$ Mpa & $f_y = 290$ Mpa). Take bolt hole type as standard & slip factor of 0.3, weld type as shop weld and edges as hand flame cut. Will the connection safe for Fin plate connectivity.

End Plate Connection

1. Design an end plate connection for a beam - beam connectivity between a primary beam NPB 600x220x107.6 and secondary beam as WB 400 for transferring a vertical factored shear force of 400 KN. Use 20 mm diameter friction grip bolts of 8.8 grade. Try plate thickness as 12 mm and thickness of weld as 10 mm. The grade of the rolled steel section is Fe 490 ($f_u = 490$ Mpa & $f_y = 350$ Mpa). Assume bolt hole type as oversized and weld as field weld and slip factor of 0.25

2. Design an end plate connection for a column flange - beam web connection between a column section as PBP 300x110 and beam section as LB 275. The factored vertical shear

force is acting at a distance of 1 m from the connection, which is generating a moment of 110 KN-m at the connection. Take Fe 410 grade of steel (f_u = 410 Mpa and f_y = 250 Mpa). Use M12 bearing bolts of 5.8 grade. Try plate thickness as 12 mm and weld thickness as 10 mm. Assume bolt hole type as standard, type of weld as shop weld, type of edge as hand flame cut.

3. An end plate connection is to be designed for column web - beam web connectivity with column section as PBP 300x94.9 and beam section as UB 254x146x43 for transferring an inclined factored load of 350 KN acting at an angle of 30 ° with the beam. Take Fe 440 grade steel (f_u = 440 Mpa & f_y = 300 Mpa). Use M16 bearing bolts of 6.8 grade. Try plate thickness and weld thickness as 12 mm. Assume bolt type as standard, type of weld as field weld and type of edge as sheared

Cleat Angle Connection

1. An ISMB 450 is connected to a column UC 305x305x118 by web cleats with a single row of bolts. If the factored vertical shear force is 350 KN and there are 4-20ϕ friction grip bolts of 8.8 grade as shown in fig. Check if the beam section is adequate for block group capacity.
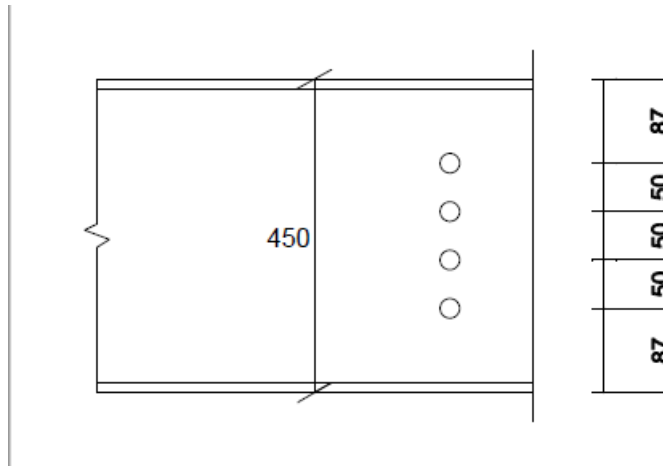
Try a cleat angle of 110x110x16. Take Fe 410 grade steel ($f_u = 410$ Mpa & $f_y = 250$ Mpa).

2. A Cleat angle connection is to be designed for a column flange – beam web connectivity for transferring a vertical factored load of 120 KN. Take column section as UC 356x368x129 and beam section as NPB 250x125x30.1. Take Fe 410 grade steel ($f_u = 410$ Mpa & $f_y = 250$ Mpa). Try a cleat angle of 80x80x12. For which of the following bolts ratio of bolt group capacity to individual bolt capacity will be more with reference to supported member.
I] M16 bearing bolts of 8.8 grade
II] M16 friction grip bolts of 8.8 grade. (Assume μf $= 0.3$)

3. A Cleat angle connection is to be designed for a beam–beam connectivity between primary beam UB 178x102x19 and secondary beam NPB 160x80x15.8 for transferring a vertical factored shear force of 35 KN. Use M12 friction grip bolts of 8.8 grade. Take Fe 490 grade steel ($f_u = 490$ Mpa & $f_y = 350$ Mpa). Try a cleat section of 80x80x10. Assume bolt hole type as standard, type of edges as hand flame cut. Assume the surfaces of metal are not treated.

Seated Angle Connection

1. Design a seat angle connection for a column web - beam flange connectivity for transferring a vertical factored shear force of 105 KN. Take beam section as WPB 280x280x103.1 and column section as PBP 360x152. Take Fe 440 grade steel ($f_u = 440$ Mpa , $f_y = 300$ Mpa). Use M12 bearing bolts of 3.6 grade. Try seat angle of size 100x100x15 and top angle of size 80x80x12. Assume bolt hole type as standard, gap between beam and support is 12 mm, type of edge as machine flame cut.

2. Design a seat angle connection for a column flange-beam flange connectivity between a beam section UB 610x305x149 and column section PBP 320x117.3 for transferring a vertical factored shear load of 175 KN. Use M20 friction grip bolts of 10.9 grade. Take Fe 490 grade steel ($f_u = 490$ Mpa, $f_y = 350$ Mpa). Use M20 friction grip bolts of 10.9 grade. Try seat angle and top angle of size 110x110x10. Assume bolt hole type as oversized, type of edges as sheared, members are exposed to corrosive environment. The metal surface is clean mill scaled.

2.2.2 Moment Connection

Extended End Plate Connection

1. Design a bolted extended end plate (both way) connection for a beam WPB 340x300x134.2 for transferring a factored inclined load of 170 KN acting at an distance of 1.2 m from the connection, the inclined load is making an angle of 45º with the horizontal. Take Fe 490 grade steel ($f_u = 490$ Mpa & $f_y = 350$ Mpa). Use M30 bearing bolts of 8.8

grade. Try an end plate of 18 mm thickness. The sizes of the weld at flange and web are 10 mm & 8 mm respectively. Assume the bolt is non-pre tensioned and bolt hole type is oversized. The type of weld is shop weld and the edge type is sawn and planed. The members are exposed to corrosive environment.

2. Design a bolted extended end plate (both way) connection for a beam UB 356 x 171 x 67 for transmitting a factored reversible moment of 165 kNm. The connection is also subjected to a shear force of 60 kN. Take Fe 440 grade steel ($f_y = 300$ MPa and $f_u = 440$ MPa). Use M24 friction grip bolts of 10.9 grade. Try an end plate of size 580 x 190 x 20 mm. The sizes of the weld at flange and web are 12 mm and 8 mm respectively. Assume the bolt to be pre-tensioned and the slip factor is 0.48. The type of edge is machine-flame cut and type of weld as field weld.
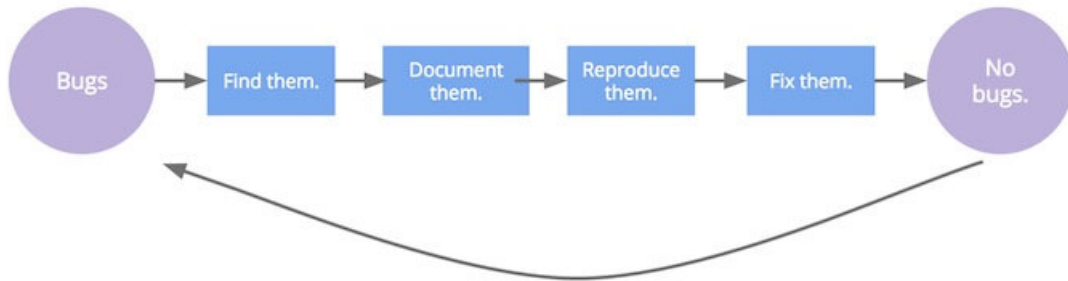
Chapter 3

Software Testing

The task was to test each and every module with its sub-connectivities currently available in Osdag. There was a need to test the software for edge and corner cases and make sure that the software gave appropriate results/suggestions. Testing of 2-D drawings and design report was equally important. Last but not the least testing of the Gui and other small features was required to ensure smooth functioning of the software. The found bugs were documented and reported to the Osdag team where the members worked on fixing the bugs/issues simultaneously.

A bug in a software is an error, flaw, or fault in a computer program or system that causes it to produce an incorrect or unexpected result or to behave in unintended ways. Every software or application either old or new might be having some bugs, sometimes noticeable while sometimes non-noticeable. And Osdag being in its initial stages, it is natural that it might have bugs.

Finding new bugs was really a challenging task, to report any bug statement it was necessary to cross check that statement for every section, connectivity and for various input values. Generally my task follows the following flow chart.

Test the software → Find bugs (If any) → Report to osdag team → Bug fixed by osdag team → Test the software after bug fixed.

All the bugs were reported on the google doc so that osdag team can assign and comment over it. Here is the link to the google doc file.

Click Here

Chapter 4

Spoken Tutorial MCQ's

The spoken tutorial project aims to make spoken tutorials on free and open source software (FOSS) available in several Indian languages, for the learner to be able to learn in the language he/she is comfortable in. The goal is to enhance the use of spoken tutorials to teach in any Indian language and to be taught to learners of all levels of expertise-Beginner,Intermediate or Advanced.

Prof.Kannan being the PI of the spoken tutorial project asked all the fellow members to provide their contribution towards spoken tutorial by creating a set of questions. It was my pleasure to contribute what I can towards spoken tutorial project. For this task I got a chance to learn new software (Git and Git-hub) and to create the MCQ questions based on the tutorials.

4.1   Questions

1. GIT is based on ?

      A. CVCS

      B. DVCS

      C. Both

      D. None

2. To see the hidden files, the command used is

    A. ls -a

    B. ls +a

    C. ls -b

    D. ls +b

3. To apply setting to all the repositories in a system, the following flag is used

    A. --local

    B. --system

    C. --global

    D. Any of the above.

4. Suppose we are in User/Desktop and in Desktop we have folders viz. a)XYZ, b)ABC, c)PQR. For changing our directory to XYZ folder, the command used will be

    A. cd XYZ

    B. cd ..XYZ

    C. mkdir XYZ

    D. mkdir ..XYZ

5. To configure XYZ named editor with git

    A. git config --global centre.editor XYZ

    B. git config --global default.editor XYZ

    C. git config --global core.editor XYZ

    D. Any of the above

6. SHA-1 is a unique id of ___ alpha-numeric characters

    A. 38

B. 36

C. 40

D. 42

7. ___ flag is used to add the files to the staging area

    A. -a

    B. -m

    C. -c

    D. -n

8. Suppose a file mytext.txt is to be deleted from the staging area, the following command is used.

    A. git rm --cached mytext.txt

    B. rm mytext.txt

    C. rm --cached mytext.txt

    D. None

9. To delete/discard the latest modification of our work, which of the following command is used

    A. git change

    B. git delete

    C. git checkout

    D. Any of the above

10. To see the commits list in one line, command used is

    A. git log --oneline

    B. git commit --oneline

    C. git show --oneline

    D. None of the above

11. The following command is used to compare the current state of the files with the latest commit.

      A. git diff

      B. git add

      C. git compare

      D. git show

12. To compare the current state of file with any of its previous commit, the command used is 'git diff __' where diff is followed by

      A. name of previous commit

      B. name of any commit

      C. commit hash of that previous commit

      D. Any of the above.

13. To compare the last revision with the 7th last revision, the command used will be,

      A. git diff Head Headbar~7

      B. git diff HEAD HEAD~7

      C. git diff LAST LAST~7

      D. git diff Last Last~7

14. A tag that is attached to an existing commit is called as,

      A. Annoted tag

      B. Lightweight tag

      C. Both

      D. None

15. To give a tag name along with the message to the current commit, which of the following commands can be used?

A. git tag –a <tagname> -m<msg>

B. git tag –a –m <msg><tagname>

C. Any of the above

D. None of the above.

16. The default branch of Git is

A. Main

B. Master

C. Default

D. None

17. The asterisk (*) symbol upon the branch shows that,

A. Currently we are working in that branch

B. That branch is the most important branch

C. There is an error in that branch

D. None

18. The following command followed by the branch name is used to switch to that branch.

A. Move

B. Switch

C. Checkout

D. All of the above

19. Suppose we have 2 branches in our repository which are i) Master, ii) Another branch, after merging Another branch with master we don't need Another branch, therefore, the command used to delete the Another branch is

A. git branch delete Another branch

B. git branch –d Master

C. git branch –d Another branch

D. None

20. A repository has 2 branches i) Master, ii) Branch. We want to merge Branch with Master but by mistake we merged Master with the branch, so to merge branch with the Master the following set of commands is to be followed (currently in Branch)

    A. git reset --hard HEAD~
       git checkout master
       git merge branch

    B. git reset --hard LAST~
       git checkout master
       git merge branch

    C. git reset --hard HEAD~
       git checkout branch
       git merge branch

    D. None

21. If we don't give the stash name, the stash will be saved in the name of ____

    A. Branch

    B. Latest commit

    C. Directory

    D. Any of the above

22. To delete a stash from the stash list, the command used is,

    A. git stash drop stash id

B. git stash delete stash id

C. Any of the above

D. None of the above

23. The most recent stash will be applied by using the command,

A. git stash recent

B. git stash current

C. git stash pop

D. None

24. The URL of a remote repository is called as,

A. Main URL

B. Remote URL

C. Remote

D. None

25. What is the function of git clone?

A. Creates a copy of an existing Git repository

B. Deletes an existing Git repository

C. Both of the above

D. None

26. The default name of Remote repository is

A. Default

B. Remote

C. Origin

D. Unspecified

4.2   Answer Key

1.A	6.C	11.A	16.B	21.B	26.C
2.A	7.A	12.C	17.A	22.A	
3.C	8.A	13.B	18.C	23.A	
4.A	9.C	14.B	19.C	24.C	
5.C	10.A	15.C	20.A	25.A	

Chapter 5

Conclusion

On the whole, this internship was a useful experience. I have gained new knowledge, skills and met many new people. I achieved several learning goals, and have moved a step further in achieving other. I got insight into professional practice. Internship has proved to be satisfactory and it has allowed as an opportunity to get an exposure of the practical implementation of theoretical fundamentals.

Here during the internship period I developed my skills in following softwares/tools :

1. Osdag

2. Basics of Python

3. Latex

4. Git and Git hub

Throughout the internship, I found that several things are important:

- **Critical and Analytical Thinking**

  To organize our tasks and assignment, we need to analyse our problems and assignment, and to formulate a good

solution to the problem. We would have to set contingency plan for the solution, so that we are well prepared for the unforeseeable situations.

- **Time Management**

  As overall project staff and programmer are always racing against tight time line and packed schedule, a proper time management will minimize facing overdue deadlines. An effective time management allows us to do our assignment efficiently and meet our schedules. Scheduling avoids time wastage and allows us to plan ahead, and gaining more as a result.

- **Goal Management**

  It is better to sub-divide the goals to a few achievable tasks, so that we will be gaining more confidence by accomplishing those tasks.

- **Colleague Interactions**

  In working environment, teamwork plays a vital role in contributing to a strong organization. Teamwork is also essential in reaching the goals of the organization as an entity. Thus, communicating and sharing is much needed in the working environment. Therefore, we should be respecting each other in work, and working together as a team, instead of working alone. This is because working together as a team is easier in reaching our targets, rather than operating individually.

  I would like to once again appreciate everyone who has made my internship training a superb experience.