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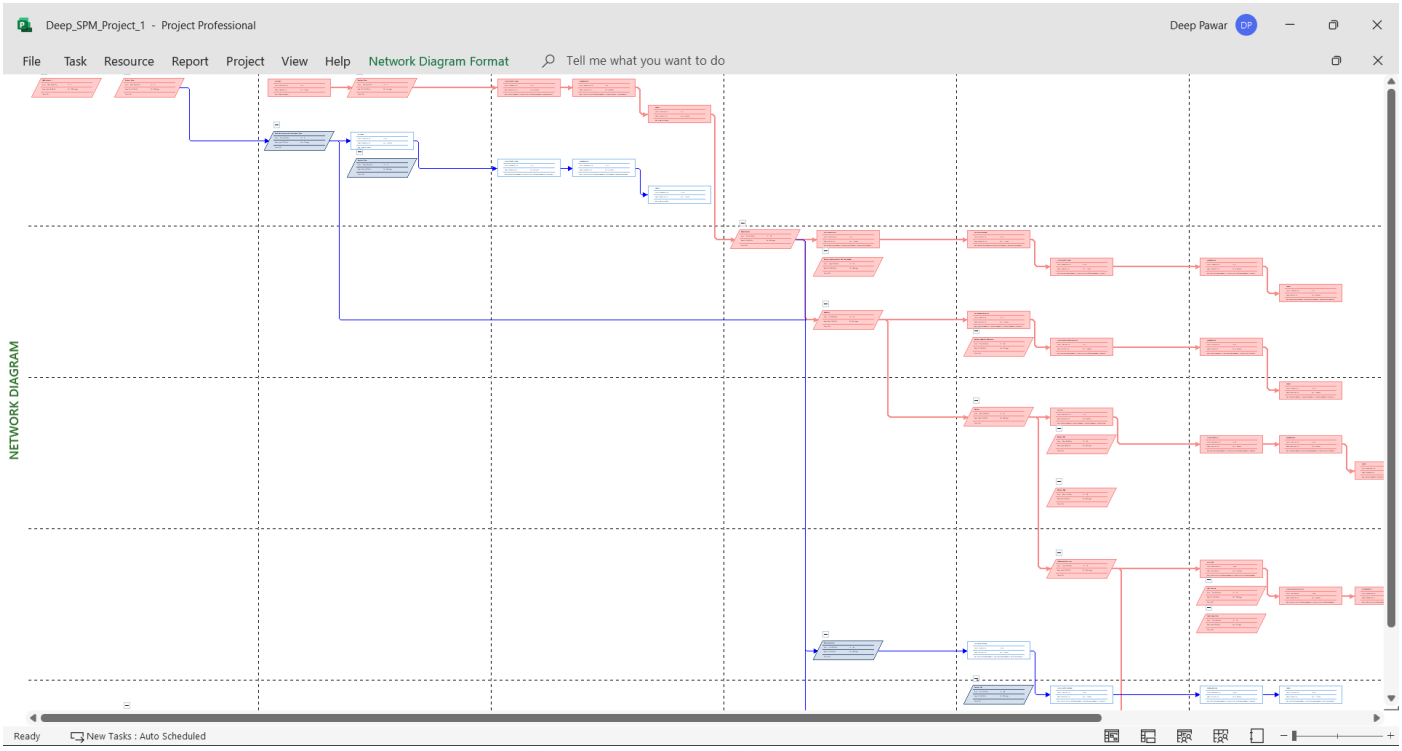
Institute: Illinois Institute of Technology

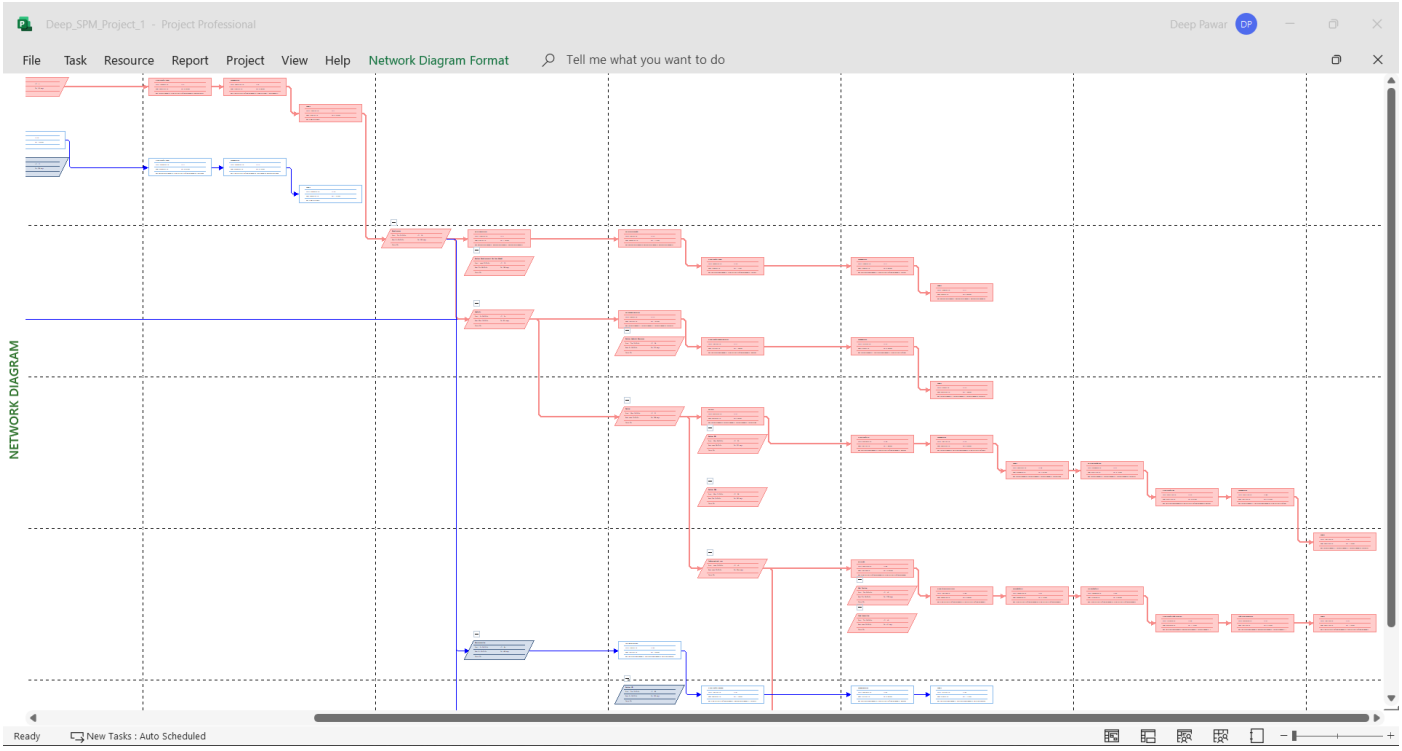
CS 587: Software Project Management

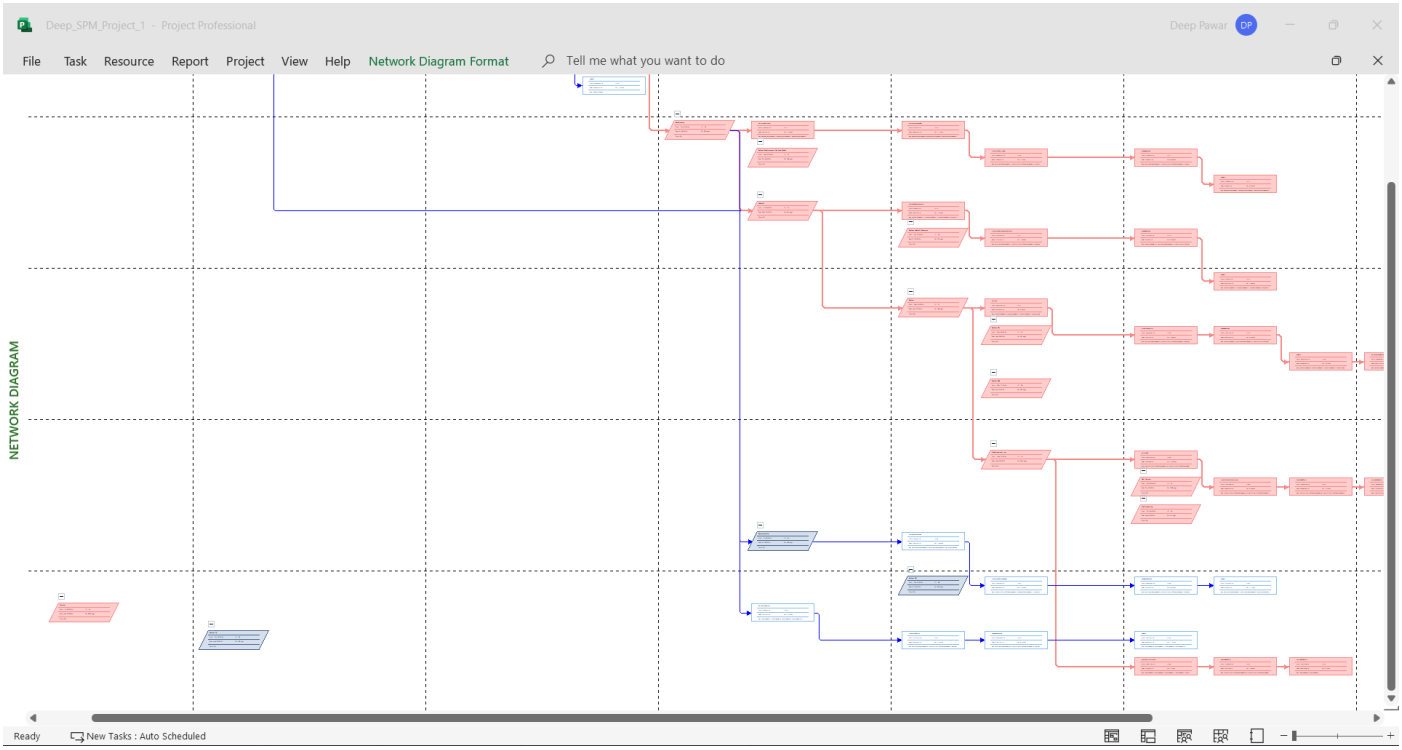
Spring 2024 - Assignment 3

1. Project 1:

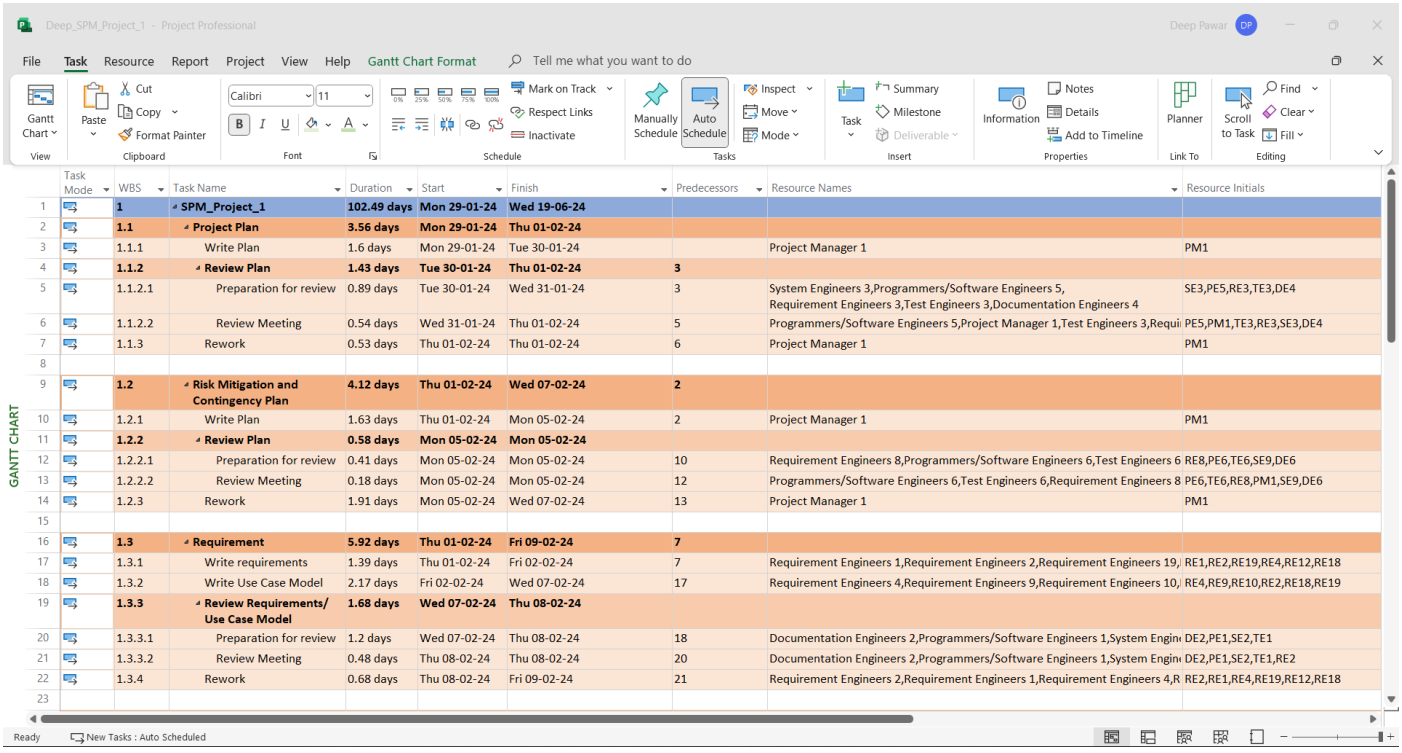
- **Network Diagram:**







- **Gantt Chart:**



	Task Mode	WBS	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Resource Initials
1		**1**	**SPM_Project_1**	**102.49 days**	**Mon 29-01-24**	**Wed 19-06-24**			
2		**1.1**	**Project Plan**	**3.56 days**	**Mon 29-01-24**	**Thu 01-02-24**			
3		1.1.1	Write Plan	1.6 days	Mon 29-01-24	Tue 30-01-24		Project Manager 1	PM1
4		**1.1.2**	**Review Plan**	**1.43 days**	**Tue 30-01-24**	**Thu 01-02-24**	**3**		
5		1.1.2.1	Preparation for review	0.89 days	Tue 30-01-24	Wed 31-01-24	3	System Engineers 3,Programmers/Software Engineers 5, Requirement Engineers 3,Test Engineers 3,Documentation Engineers 4	SE3,PE5,RE3,TE3,DE4
6		1.1.2.2	Review Meeting	0.54 days	Wed 31-01-24	Thu 01-02-24	5	Programmers/Software Engineers 5,Project Manager 1,Test Engineers 3,Requi	PE5,PM1,TE3,RE3,SE3,DE4
7		1.1.3	Rework	0.53 days	Thu 01-02-24	Thu 01-02-24	6	Project Manager 1	PM1
8									
9		**1.2**	**Risk Mitigation and Contingency Plan**	**4.12 days**	**Thu 01-02-24**	**Wed 07-02-24**	**2**		
10		1.2.1	Write Plan	1.63 days	Thu 01-02-24	Mon 05-02-24	2	Project Manager 1	PM1
11		**1.2.2**	**Review Plan**	**0.58 days**	**Mon 05-02-24**	**Mon 05-02-24**			
12		1.2.2.1	Preparation for review	0.41 days	Mon 05-02-24	Mon 05-02-24	10	Requirement Engineers 8,Programmers/Software Engineers 6,Test Engineers 6	RE8,PE6,TE6,SE9,DE6
13		1.2.2.2	Review Meeting	0.18 days	Mon 05-02-24	Mon 05-02-24	12	Programmers/Software Engineers 6,Test Engineers 6,Requirement Engineers 8	PE6,TE6,RE8,PM1,SE9,DE6
14		1.2.3	Rework	1.91 days	Mon 05-02-24	Wed 07-02-24	13	Project Manager 1	PM1
15									
16		**1.3**	**Requirement**	**5.92 days**	**Thu 01-02-24**	**Fri 09-02-24**	**7**		
17		1.3.1	Write requirements	1.39 days	Thu 01-02-24	Fri 02-02-24	7	Requirement Engineers 1,Requirement Engineers 2,Requirement Engineers 19,	RE1,RE2,RE19,RE4,RE12,RE18
18		1.3.2	Write Use Case Model	2.17 days	Fri 02-02-24	Wed 07-02-24	17	Requirement Engineers 4,Requirement Engineers 9,Requirement Engineers 10,	RE4,RE9,RE10,RE2,RE18,RE19
19		**1.3.3**	**Review Requirements/ Use Case Model**	**1.68 days**	**Wed 07-02-24**	**Thu 08-02-24**			
20		1.3.3.1	Preparation for review	1.2 days	Wed 07-02-24	Thu 08-02-24	18	Documentation Engineers 2,Programmers/Software Engineers 1,System Engin	DE2,PE1,SE2,TE1
21		1.3.3.2	Review Meeting	0.48 days	Thu 08-02-24	Thu 08-02-24	20	Documentation Engineers 2,Programmers/Software Engineers 1,System Engin	DE2,PE1,SE2,TE1,RE2
22		1.3.4	Rework	0.68 days	Thu 08-02-24	Fri 09-02-24	21	Requirement Engineers 2,Requirement Engineers 1,Requirement Engineers 4,R	RE2,RE1,RE4,RE19,RE12,RE18
23									

- **Calculation:**

The formula to calculate duration:

$$\text{Number of days} = \frac{(\text{Amount of work / Productivity Rate})}{8}$$

Here,

8 hours is considered as 1 day as per 9-5 office hours

- **Example Calculation:**

1. **Project Plan - Write plan:**
   - ✓ Amount of work: 51 pages
   - ✓ Productivity rate: 2 pages/hour
   - ✓ Duration = $\frac{51/2}{8}$ = 3.19 days
2. **Risk Mitigation and Contingency Plan – Write Plan**
   - ✓ Amount of work: 65 pages
   - ✓ Productivity rate: 5 pages/hour
   - ✓ Duration = $\frac{65/5}{8}$ = 1.63 days
3. **Requirement – Write Use case Models:**
   - ✓ Amount of work: 167 requests
   - ✓ Productivity rate: 5 requests/hour
   - ✓ Duration = $\frac{167/5}{8}$ = 4.18 days
4. **Analysis –Review Meeting:**
   - ✓ Amount of work: 89 pages
   - ✓ Productivity rate: 3 pages/hour
   - ✓ Duration = $\frac{89/3}{8}$ = 3.71 days
5. **Design – Rework**
   - ✓ Amount of work: 184 pages
   - ✓ Productivity rate: 5 pages/hour
   - ✓ Duration/Effort = $\frac{184/5}{8}$ = 4.6 days
6. **Coding and Unit Test - Prep for code inspection**
   - ✓ Amount of work: 5123 SLOC
   - ✓ Productivity rate: 5 SLOC/hour
   - ✓ Duration/Effort = $\frac{5123/5}{8}$ = 128.08 days
7. **Testing – Execute TP (test cases):**
   - ✓ Amount of work: 231 pages
   - ✓ Productivity rate: 5 pages/day
   - ✓ Duration/Effort = $\frac{231/5}{8}$ = 46.2 days
8. **Documentation - Review UD Meeting:**
   - ✓ Amount of work: 146 pages
   - ✓ Productivity rate: 4 pages/hour
   - ✓ Duration/Effort = $\frac{146/4}{8}$ = 4.56 days

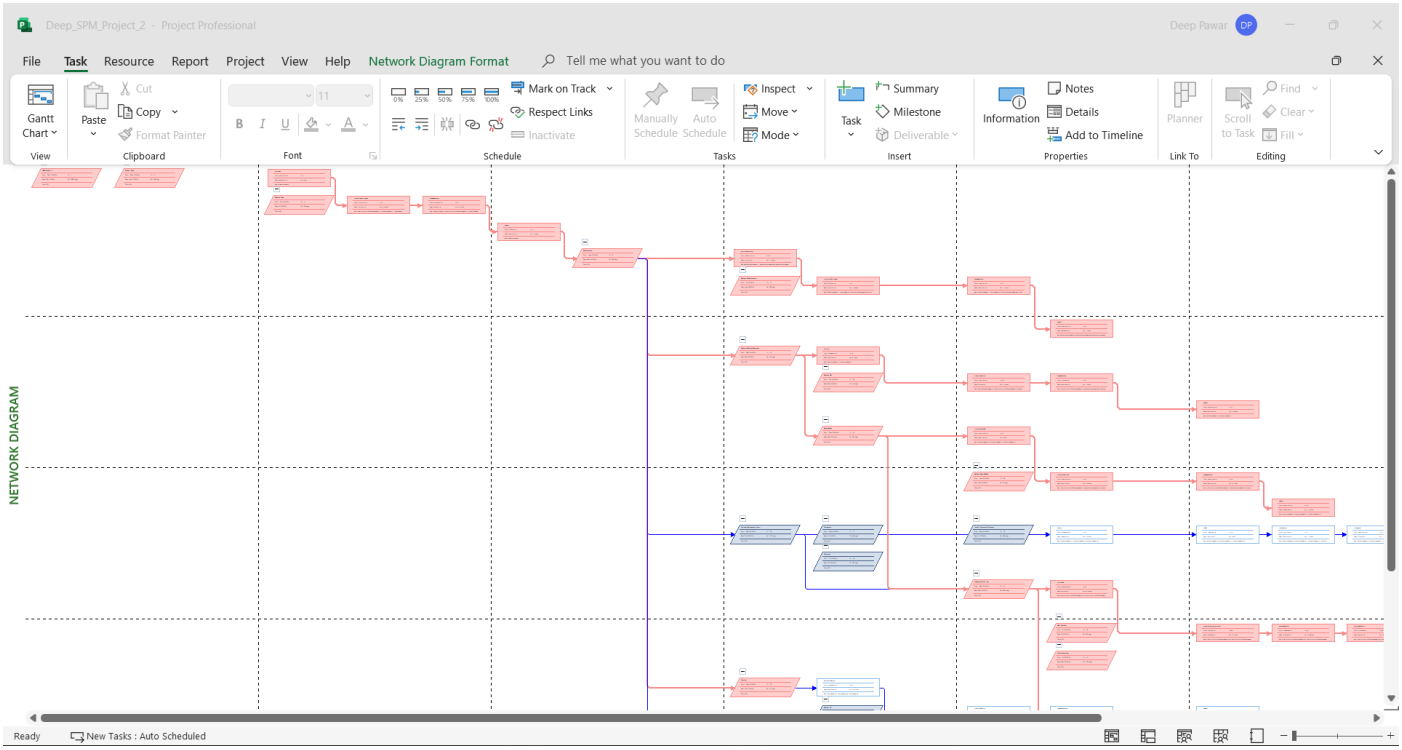
- **Below is the rest of the calculation of each remaining Task:**

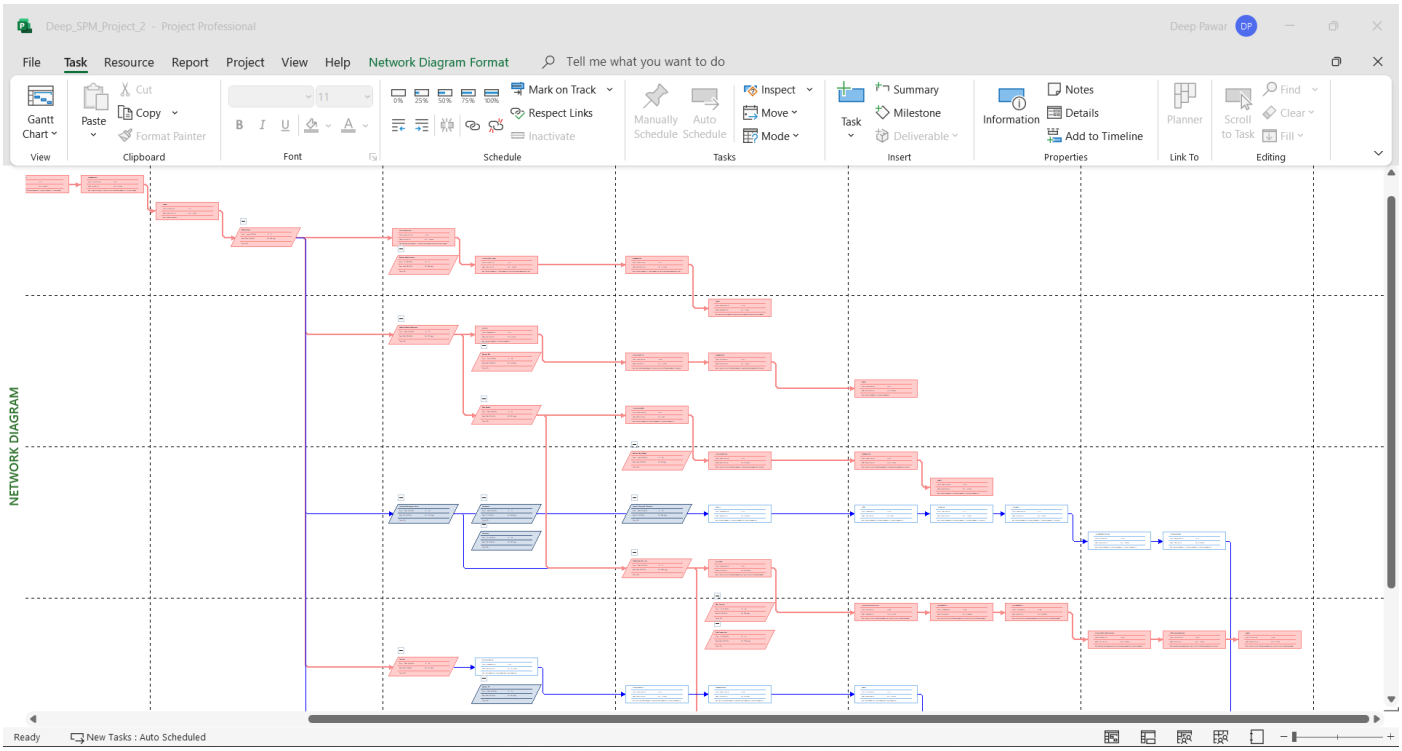
Task	Amount of Work	Productivity Rate	Calculated Duration (in days)
Project Plan			
Write Plan	51 pages	2 pages/Hour	3.19
Review Plan			
Preparation for review		4 pages/Hour	1.59
Review Meeting		5 pages/Hour	1.28
Rework	32 defects	5 defects/Hour	0.8
Risk Mitigation and Contingency Plan			
Write Plan	65 pages	5 pages/Hour	1.63
Review Plan			
Preparation for review		5 pages/Hour	1.63
Review Meeting		10 pages/Hour	0.81
Rework	61 defects	4 defects/Hour	1.91
Requirement			
Write requirements	167 Req	5 Req/Hour	4.18
Write Use Case Model	78 Use Cases	3 use case/2 Hours	6.5
Review Requirements/ Use Case Model			
Preparation for review		18 Req/Hour	1.16
		4 Use Cases/Hour	2.44
Review Meeting		28 Req/Hour	0.75
		6 Use Cases/Hour	1.63
Rework	189 defects	10 defects/Hour	2.36
Analysis			
Write Analysis Document	89 pages	3 pages/Hour	3.71
Review Analysis Document			
Preparation for Analysis Document		4 pages/Hour	2.78
Review Meeting		9 pages/Hour	1.24
Rework	123 defects	5 defects/Hour	3.08
Design			
Write DD	184 pages	5 pages/Hour	4.6
Review DD			
Preparation for DD		4 pages/Hour	5.75
Review Meeting		8 pages/Hour	2.88
Rework	231 defects	4 defects/Hour	7.22
Write Data Model (DM)	34 pages	1 page/4 Hours	17
Review DM			
Preparation for DM		3 pages/Hour	1.42
Review Meeting		5 pages/Hour	0.85
Rework	92 defects	5 defects/Hour	2.3
Coding and unit test			
Write Code	5123 SLOC	5 SLOC/Hour	128.08
Unit Testing			
Prepare/Execute Test Cases	317 test cases	10 Test Cases/Day	31.7
Fix Found Defects	271 Defects	8 Defects/Day	33.88
Test Fixed Defects	271 Defects	12 Defects/Day	22.58
Code Inspection			
Preparation for Code Inspection		100 SLOC/Hour	6.40
Code Inspection Meeting		210 SLOC/Hour	3.05

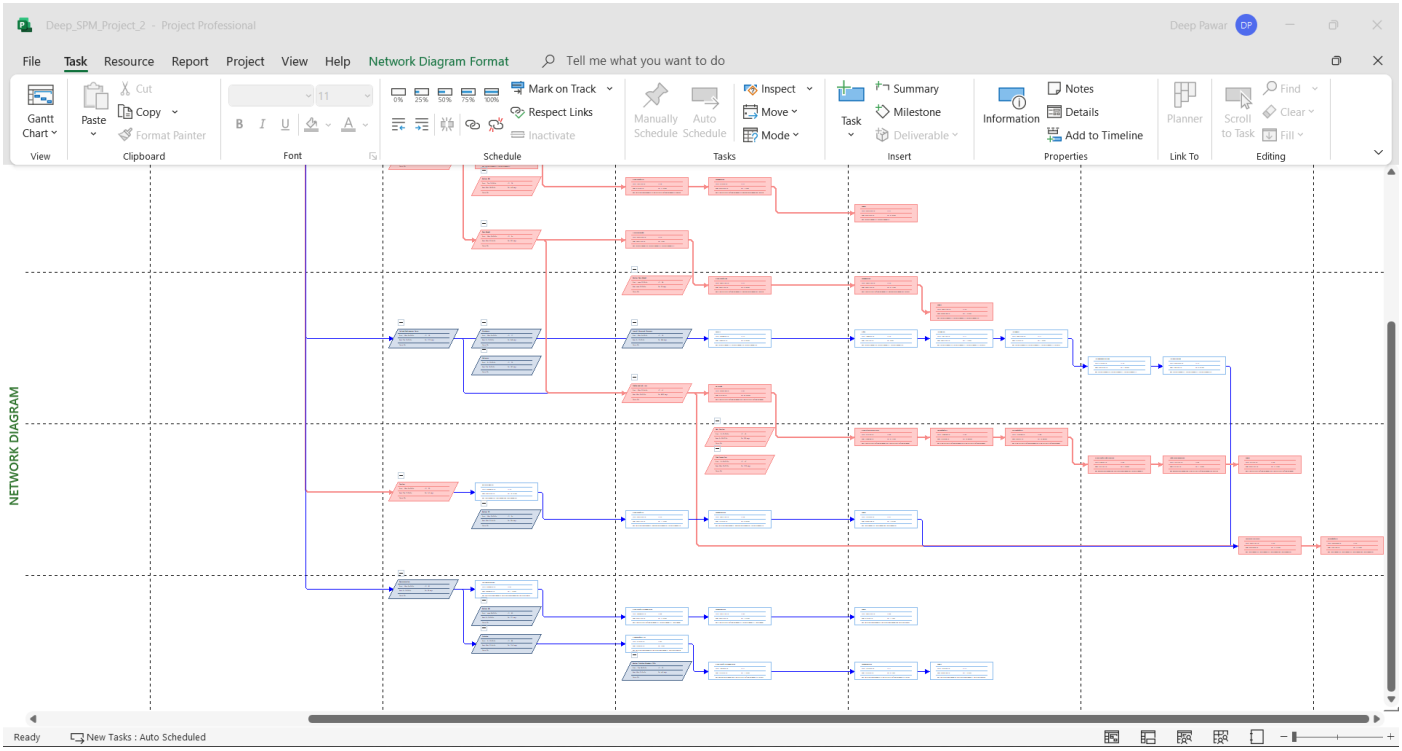
Rework	195 defects	5 defects/Hour	4.88
Testing			
Write test plan (TP)	231 pages	5 pages/Day	46.2
Review TP			
Preparation for TP		4 pages/Hour	7.29
Review TP Meeting		8 pages/Hour	3.61
Rework	310 defects	7 defects/Hour	5.54
Execute TP (test cases)	345 test cases	14 test cases/day	24.64
Fix Found Defects	248 defects	5 defects/day	49.6
Test Fixed Defects	248 defects	10 defects/day	24.8
Documentation			
User Documentation	146 pages	4 pages/Hour	4.56
Review UD			
Preparation for UD Review		4 pages/Hour	4.56
Review UD Meeting		10 pages/Hour	1.83
Rework	283 defects	6 defects/Hour	5.90

2. Project 2:

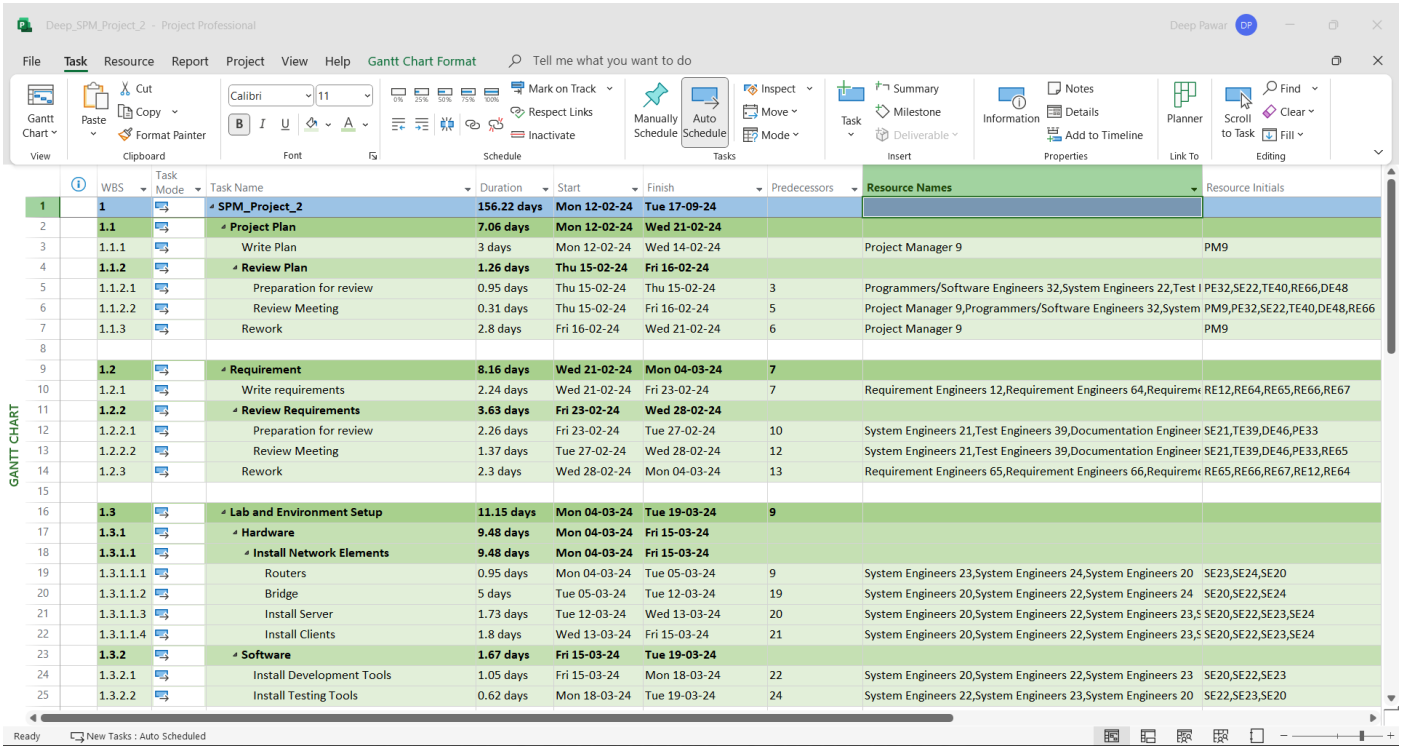
- **Network Diagram:**







- **Gantt Chart:**



	WBS	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Resource Initials
1	1		SPM_Project_2	156.22 days	Mon 12-02-24	Tue 17-09-24			
2	1.1		Project Plan	7.06 days	Mon 12-02-24	Wed 21-02-24			
3	1.1.1		Write Plan	3 days	Mon 12-02-24	Wed 14-02-24		Project Manager 9	PM9
4	1.1.2		Review Plan	1.26 days	Thu 15-02-24	Fri 16-02-24			
5	1.1.2.1		Preparation for review	0.95 days	Thu 15-02-24	Thu 15-02-24	3	Programmers/Software Engineers 32,System Engineers 22,Test I	PE32,SE22,TE40,RE66,DE48
6	1.1.2.2		Review Meeting	0.31 days	Thu 15-02-24	Fri 16-02-24	5	Project Manager 9,Programmers/Software Engineers 32,System	PM9,PE32,SE22,TE40,DE48,RE66
7	1.1.3		Rework	2.8 days	Fri 16-02-24	Wed 21-02-24	6	Project Manager 9	PM9
8									
9	1.2		Requirement	8.16 days	Wed 21-02-24	Mon 04-03-24	7		
10	1.2.1		Write requirements	2.24 days	Wed 21-02-24	Fri 23-02-24	7	Requirement Engineers 12,Requirement Engineers 64,Requirem	RE12,RE64,RE65,RE66,RE67
11	1.2.2		Review Requirements	3.63 days	Fri 23-02-24	Wed 28-02-24			
12	1.2.2.1		Preparation for review	2.26 days	Fri 23-02-24	Tue 27-02-24	10	System Engineers 21,Test Engineers 39,Documentation Engineer	SE21,TE39,DE46,PE33
13	1.2.2.2		Review Meeting	1.37 days	Tue 27-02-24	Wed 28-02-24	12	System Engineers 21,Test Engineers 39,Documentation Engineer	SE21,TE39,DE46,PE33,RE65
14	1.2.3		Rework	2.3 days	Wed 28-02-24	Mon 04-03-24	13	Requirement Engineers 65,Requirement Engineers 66,Requirem	RE65,RE66,RE67,RE12,RE64
15									
16	1.3		Lab and Environment Setup	11.15 days	Mon 04-03-24	Tue 19-03-24	9		
17	1.3.1		Hardware	9.48 days	Mon 04-03-24	Fri 15-03-24			
18	1.3.1.1		Install Network Elements	9.48 days	Mon 04-03-24	Fri 15-03-24			
19	1.3.1.1.1		Routers	0.95 days	Mon 04-03-24	Tue 05-03-24	9	System Engineers 23,System Engineers 24,System Engineers 20	SE23,SE24,SE20
20	1.3.1.1.2		Bridge	5 days	Tue 05-03-24	Tue 12-03-24	19	System Engineers 20,System Engineers 22,System Engineers 24	SE20,SE22,SE24
21	1.3.1.1.3		Install Server	1.73 days	Tue 12-03-24	Wed 13-03-24	20	System Engineers 20,System Engineers 22,System Engineers 23,S	SE20,SE22,SE23,SE24
22	1.3.1.1.4		Install Clients	1.8 days	Wed 13-03-24	Fri 15-03-24	21	System Engineers 20,System Engineers 22,System Engineers 23,S	SE20,SE22,SE23,SE24
23	1.3.2		Software	1.67 days	Fri 15-03-24	Tue 19-03-24			
24	1.3.2.1		Install Development Tools	1.05 days	Fri 15-03-24	Mon 18-03-24	22	System Engineers 20,System Engineers 22,System Engineers 23	SE20,SE22,SE23
25	1.3.2.2		Install Testing Tools	0.62 days	Mon 18-03-24	Tue 19-03-24	24	System Engineers 22,System Engineers 23,System Engineers 20	SE22,SE23,SE20

- **Calculation:**

The formula to calculate duration:

$$\text{Number of days} = \frac{(\text{Amount of work} / \text{Productivity Rate})}{8}$$

Here, 8 hours is considered as 1 day as per 9-5 office hours

- **Example Calculation:**

1. **Project Plan - Write plan:**
   - ✓ Amount of work: 120 pages
   - ✓ Productivity rate: 5 pages/hour
   - ✓ Duration = $\frac{120/5}{8}$ = 3 days
2. **Requirement – Write requirements:**
   - ✓ Amount of work: 410 requests
   - ✓ Productivity rate: 4 requests/hour
   - ✓ Duration = $\frac{410/4}{8}$ = 12.8 days
3. **Lab and environment Setup - Routers:**
   - ✓ Amount of work: 10
   - ✓ Productivity rate: 3 Routers/day
   - ✓ Duration = $\frac{10}{8}$ = 3.33 days
4. **Analysis/Design document –Write DD:**
   - ✓ Amount of work: 403 pages
   - ✓ Productivity rate: 4 pages/hour
   - ✓ Duration = $\frac{403/4}{8}$ = 12.6 days
5. **Data Model – Create Data Model:**
   - ✓ Amount of work: 48 pages
   - ✓ Productivity rate: 1 pages/hour
   - ✓ Duration/Effort = $\frac{48/1}{8}$ = 6 days
6. **Coding and Unit Test – Write Code**
   - ✓ Amount of work: 8420 SLOC
   - ✓ Productivity rate: 6 SLOC/hour
   - ✓ Duration/Effort = $\frac{8420/6}{8}$ = 175.42 days
7. **Testing – Write test plan (TP):**
   - ✓ Amount of work: 357 pages
   - ✓ Productivity rate: 8 pages/day
   - ✓ Duration/Effort = $\frac{357}{8}$ = 44.63 days
8. **Documentation – User Documentation:**
   - ✓ Amount of work: 510 pages
   - ✓ Productivity rate: 5 pages/hour
   - ✓ Duration/Effort = $\frac{510/5}{8}$ = 12.75 days
9. **Training – Training Handouts (TH):**
   - ✓ Amount of work: 280 pages
   - ✓ Productivity rate: 1 pages/hour
   - ✓ Duration/Effort = $\frac{280/1}{8}$ = 35 days

- **Below is the rest of the calculation of each remaining Task:**

Task	Amount of Work	Productivity Rate	Calculated Duration (in days)
Project Plan			
Write Plan	120 pages	5 pages/Hour	3
Review Plan			
Preparation for review		3 pages/Hour	5
Review Meeting		10 pages/Hour	1.5
Rework	156 defects	7 defects/Hour	2.8
Requirement			
Write requirements	410 Req	4 Req/Hour	12.81
Review Requirements			
Preparation for review		5 Req/Hour	10.25
Review Meeting		8 Req/Hour	6.41
Rework	378 defects	4 defects/Hour	11.81
Lab and Environment Setup			
Hardware			
Install Network Elements			
Routers	10	3 Routers/day	3.33
Bridge	30	2 Bridges/day	15
Install Server	26 servers	3 servers/day	8.66
Install Clients	90 clients	10 clients/day	9
Software			
Install Development Tools	21 tools	5 tools/day	4.2
Install Testing Tools	21 tools	8 tools/day	2.62
Analysis/Design Document			
Write DD	403 pages	4 pages/Hour	12.6
Review DD			
Preparation for DD		4 pages/Hour	12.6
Review Meeting		8 pages/Hour	6.3
Rework	343 defects	5 defects/Hour	8.6
Data Model			
Create Data Model	48 pages	1 page/Hour	6
Review Data Model			
Preparation for DM		4 pages/Hour	1.5
Review Meeting		10 pages/Hour	0.6
Rework	309 defects	5 defects/Hour	7.73
Coding and unit test			
Write Code	8420 SLOC	6 SLOC/Hour	175.42
Unit Testing			
Prepare/Execute Test Cases	945 test cases	5 Test Cases/Hour	23.62
Fix Found Defects	783 Defects	13 Defects/Day	60.23
Test Fixed Defects	783 Defects	10 Defects/Day	78.3
Code Inspection			
Preparation for Code Inspection		70 SLOC/Hour	15.04
Code Inspection Meeting		120 SLOC/Hour	8.77
Rework	935 defects	5 defects/Hour	23.38
Testing			
Write test plan (TP)	357 pages	8 pages/Day	44.63
Review TP			

Preparation for TP		5 pages/Hour	8.93
Review TP Meeting		10 pages/Hour	4.46
Rework	290 defects	5 defects/Hour	7.25
Execute TP (test cases)	810 test cases	8 test cases/day	101.25
Fix Found Defects	306 defects	5 defects/day	61.2
Documentation			
User Documentation	510 pages	5 page/Hour	12.75
Review UD			
Preparation for UD Review meeting		5 pages/Hour	12.75
Review UD Meeting		7 pages/Hour	9.11
Rework	490 defects	5 defects/Hour	12.25
Training			
Training Handouts (TH)	280 pages	1 page/Hour	35
Review Training Handouts (TH)			
Preparation for TH review meeting		5 pages/Hour	7
Review TH Meeting		10 pages/Hour	3.5
Rework	632 defects	8 defects/Hour	9.88

3. Project 3:

- **Part I: Extrapolate the Estimation Baseline**

a. The formula to calculate the productivity rate of tasks for project 3:

Productivity Rate = $\frac{Productivity\ Rate\ of\ Same\ Task\ in\ Project\ 1 + Productivity\ Rate\ of\ Same\ Task\ in\ Project\ 2}{2}$

b. The formula to calculate amount of work of tasks for project 3:

In Project 1:

P1 = $\frac{\text{Amount of work in same task of Project 1} * 1000}{\text{Amount of work in main task of Project 1}}$

In Project 2:

P2 = $\frac{\text{Amount of work in same task of Project 2} * 1000}{\text{Amount of work in main task of Project 2}}$

In Project 3:

Taking the average of P1 and P2 = $\frac{P1+P2}{2}$

Amount of work = (Average of P1 and P2) * $\frac{\text{Amount of work in main task of Project 3}}{1000}$

- **Calculations:**

1. Project Plan:
   a. Write Plan

   Productivity Rate = $\frac{5+2}{2}$ = 3.5 ≈ 4 pages/Hour

   b. Preparation for review

   Productivity Rate = $\frac{4+3}{2}$ = 3.5 ≈ 4 pages/Hour

   c. Review Meeting

   Productivity Rate = $\frac{5+10}{2}$ = 7.5 ≈ 8 pages/Hour

   d. Rework

   Productivity Rate = $\frac{5+7}{2}$ = 6 defects/Hour

   Amount of Work =

   Project 1 = $\frac{32*1000}{51}$ = 627.45 ≈ 628

   Project 2 = $\frac{156*1000}{120}$ = 1300

   Project 3 = $\frac{628+1300}{2}$ = 964 * 0.182 = 175.44 ≈ 175 defects

2. Requirement:
   a. Write requirements

   Productivity Rate = $\frac{5+4}{2}$ = 4.5 ≈ 5 Req/Hour

   b. Preparation for review

   Productivity Rate = $\frac{18+5}{2}$ = 11.5 ≈ 12 Req/Hour

   c. Review Meeting

   Productivity Rate = $\frac{28+8}{2}$ = 18 Req/Hour

   d. Rework

   Productivity Rate = $\frac{10+4}{2}$ = 7 defects/Hour

   Amount of Work =

   Project 1 = $\frac{189*1000}{167}$ = 1131.73 ≈ 1132

   Project 2 = $\frac{378*1000}{410}$ = 921.95 ≈ 922

   Project 3 = $\frac{1132+922}{2}$ = 1027 * 0.189 = 194.103 ≈ 194 defects

3. Analysis (Only Project 1 has separate Analysis task field so we will take productivity rates as it is)
   a. Write Analysis Document

   Productivity Rate = 3 pages/Hour

   b. Preparation for Analysis Document

   Productivity Rate = 4 pages/Hour

   c. Review Meeting

   Productivity Rate = 9 pages/Hour

   d. Rework

   Productivity Rate = 5 defects/Hour

   Amount of Work =

   Project 1 = $\frac{123*1000}{89}$ = 1382.022 ≈ 1382

   Project 3 = 1382 * 0.143 = 197.626 ≈ 198 defects

4. Design:
   a. Write DD

   Productivity Rate = $\frac{5+4}{2}$ = 4.5 ≈ 5 pages/Hour

   b. Preparation for DD

   Productivity Rate = $\frac{4+4}{2}$ = 4 pages/Hour

c. Review Meeting

Productivity Rate = $\frac{8+8}{2}$ = 8 pages/Hour

d. Rework

Productivity Rate = $\frac{5+4}{2}$ = 4.5 ≈ 5 defects/Hour

Amount of Work =

Project 1 = $\frac{231*1000}{184}$ = 1255.43 ≈ 1255

Project 2 = $\frac{343*1000}{403}$ = 851.11 ≈ 851

Project 3 = $\frac{1255+851}{2}$ = 1053 * 0.189 = 199.017 ≈ 199 defects

5. Coding

Coding tasks is given in Part I as a walkthrough example as shown below:

Part I

Calculate the missing data in the following Estimation Baseline Table

Extrapolate the Estimation Baseline
Based on the Data Given in
Assignment #1 and Assignment #2

Phase	Tasks	Work Size	Productivity Rate
Project Plan	??	??	??
Process Updates			
Requirements	??	??	??
Development/Test Environment			
Analysis	??	??	??
Design	??	??	??
Coding			
	Write Code	4100 SLOC	5 SLOC/Hour
	Unit Testing		
	Prepare/Execute Test Cases	289 test cases	5 Test Case/Hour
	Fix Found Defects	289 defects	10 Defects/Day
	Test Fixed Defects	289 defects	8 Defects/Day
	Code Inspection		
	Preparation for Code Inspection	4100 SLOC	89 SLOC/Hour
	Code Inspection Meeting	4100 SLOC	123 SLOC/Hour
	Rework	349 defects	5 defects/Hour
Testing			
Documentation	??	??	??

Red Cells	You Need to Calculate
Green Cells	Data Given
Yellow Cells	Walkthrough Example

I also calculated productivity rates and work size of Coding tasks manually as below:

a. Write Code

Productivity Rate = $\frac{5+6}{2}$ = 5.5 ≈ 6 SLOC/Hour

b. Prepare/Execute Test Cases

Productivity Rate = $\frac{(\frac{10}{8})+5}{2}$ = 3.125 ≈ 3 Test Cases/Hour

…..10 is divided by 8 to convert it into hours

Amount of Work =

Project 1 = $\frac{317 * 1000}{5123}$ = 61.87 ≈ 62

Project 2 = $\frac{945 * 1000}{8420}$ = 112.23 ≈ 112

Project 3 = $\frac{62+112}{2}$ = 87 * 4.1 = 356.7 ≈ 357 Test cases

c. Fix Found Defects

Productivity Rate = $\frac{8+13}{2}$ = 10.5 ≈ 11 Defects/Day

Amount of Work =

Project 1 = $\frac{271*1000}{5123}$ = 52.89 ≈ 53

Project 2 = $\frac{783 * 1000}{8420}$ = 92.99 ≈ 93

Project 3 = $\frac{53+93}{2}$ = 73 * 4.1 = 299.3 ≈ 299 Defects

d. Test Fixed Defects

Productivity Rate = $\frac{12+10}{2}$ = 11 Defects/Day

Amount of Work =

Project 1 = $\frac{271*1000}{5123}$ = 52.89 ≈ 53

Project 2 = $\frac{783 * 1000}{8420}$ = 92.99 ≈ 93

Project 3 = $\frac{53+93}{2}$ = 73 * 4.1 = 299.3 ≈ 299 Defects

e. Preparation for Code Inspection

Productivity Rate = $\frac{100+70}{2}$ = 85 SLOC/Hour

Amount of Work = 4100 SLOC

f. Code Inspection Meeting

Productivity Rate = $\frac{210+120}{2}$ = 165 SLOC/Hour

Amount of Work = 4100 SLOC

g. Rework

Productivity Rate = $\frac{5+5}{2}$ = 5 defects/Hour

Amount of Work =

Project 1 = $\frac{195 * 1000}{5123}$ = 38.06 ≈ 38

Project 2 = $\frac{935 * 1000}{8420}$ = 111.04 ≈ 111

Project 3 = $\frac{38+111}{2}$ = 74.5 ≈ 75 * 4.1 = 307.5 ≈ 308 Defects

6. Documentation

a. User Documentation

Productivity Rate = $\frac{4+5}{2}$ = 4.5 ≈ 5 page/Hour

b. Preparation for Review UD

Productivity Rate = $\frac{4+5}{2}$ = 4.5 ≈ 5 page/Hour

c. Review UD Meeting

Productivity Rate = $\frac{10+7}{2}$ = 8.5 ≈ 9 page/Hour

d. Rework

Productivity Rate = $\frac{6+5}{2}$ = 5.5 ≈ 6 defects/Hour

Amount of Work =

Project 1 = $\frac{283 * 1000}{146}$ = 1938.35 ≈ 1938

Project 2 = $\frac{490 * 1000}{510}$ = 960.78 ≈ 961

Project 3 = $\frac{1938+961}{2}$ = 1449.5 ≈ 1450 * 0.233 = 337.85 ≈ 338 Defects

- **Duration Calculation:**

The formula to calculate duration:

$$\text{Number of days} = \frac{(\text{Amount of work} / \text{Productivity Rate})}{8}$$

Here,

8 hours is considered as 1 day as per 9-5 office hours

- **Example Calculation:**

1. **Project Plan - Write plan:**
   - ✓ Amount of work: 182 pages
   - ✓ Productivity rate: 4 pages/hour
   - ✓ Duration = $\frac{182/4}{8}$ = 5.68 days
2. **Documented Software Development Process Updates - Process Changes:**
   - ✓ Amount of work: 78 changes
   - ✓ Productivity rate: 5 Changes/Hour
   - ✓ Duration = $\frac{78/5}{8}$ = 1.95 days
3. **Requirement – Write requirements:**
   - ✓ Amount of work: 189 requests
   - ✓ Productivity rate: 5 requests/hour
   - ✓ Duration = $\frac{189/5}{8}$ = 4.73 days
4. **Build the development and testing lab environment - Hardware Environment:**
   - ✓ Amount of work: 13 servers
   - ✓ Productivity rate: 1 server/day
   - ✓ Duration = $\frac{13}{1}$ = 13 days
5. **Analysis - Write Analysis Document:**
   - ✓ Amount of work: 143 pages
   - ✓ Productivity rate: 3 pages/hour
   - ✓ Duration = $\frac{143/3}{8}$ = 5.95 days
6. **Design - Write DD:**
   - ✓ Amount of work: 189 pages
   - ✓ Productivity rate: 5 pages/hour
   - ✓ Duration = $\frac{189/5}{8}$ = 4.73 days
7. **Coding - Write Code:**
   - ✓ Amount of work: 4100 SLOC
   - ✓ Productivity rate: 6 SLOC/Hour
   - ✓ Duration = $\frac{4100/6}{8}$ = 85.42 days
8. **Testing - Write test plan (TP):**
   - ✓ Amount of work: 167 pages
   - ✓ Productivity rate: 10 pages/Day
   - ✓ Duration = $\frac{167}{10}$ = 16.7 days
9. **Documentation - User Documentation:**
   - ✓ Amount of work: 233 pages
   - ✓ Productivity rate: 5 page/Hour
   - ✓ Duration = $\frac{233/5}{8}$ = 5.83 days

- **Below is the rest of the calculation of each remaining Task:**

Task	Amount of Work	Productivity Rate	Calculated Duration (in days)
Project Plan			
Write Plan	182 pages	4 pages/ Hour	5.68
Review Plan			
Preparation for review		4 pages/ Hour	5.68
Review Meeting		8 pages/ Hour	2.84
Rework	175 defects	6 defects/ Hour	3.64
Documented Software Development Process Updates			
Process Changes	78 changes	5 Changes/ Hour	1.95
Review Changes			
Preparation for review		5 Changes/ Hour	1.95
Review Meeting		10 Changes/ Hour	0.98
Rework	87 defects	4 defects/ Hour	2.72
Requirement			
Write requirements	189 Req	5 Req/ Hour	4.73
Review Requirements			
Preparation for review		12 Req/ Hour	1.97
Review Meeting		18 Req/ Hour	1.31
Rework	194 defects	7 defects/ Hour	3.46
Build the development and testing lab environment			
Hardware Environment			
Servers	13 servers	1 server/ day	13
Clients	19 clients	5 clients/ day	3.8
Software Development Tools			
Build/ Compile Tools	10 tools	1 tool/ Hour	1.25
Software Testing Tools			
Test Cases Execution Tools	5 tools	2 tool/ day	2.5
Simulation Tools	8 tools	2 tool/ day	4
Analysis			
Write Analysis Document	143 pages	3 pages/ Hour	5.95
Review Analysis Document			
Preparation for Analysis Document		4 pages/ Hour	4.46
Review Meeting		9 pages/ Hour	1.98
Rework	198 defects	5 defects/ Hour	4.95
Design			
Write DD	189 pages	5 pages/ Hour	4.73
Review DD			
Preparation for DD		4 pages/ Hour	5.90
Review Meeting		8 pages/ Hour	2.95
Rework	199 defects	5 defects/ Hour	4.98
Coding			
Write Code	4100 SLOC	6 SLOC/ hour	85.42
Unit Testing			
Prepare/Execute Test Cases	357 test cases	3 Test Case/ Hour	14.86
Fix Found Defects	299 defects	11 Defects/ Day	27.18
Test Fixed Defects	299 defects	11 Defects/ Day	27.18

Code Inspection			
Preparation for Code Inspection	4100 SLOC	85 SLOC/ Hour	6.03
Code Inspection Meeting	4100 SLOC	165 SLOC/ Hour	3.11
Rework	308 defects	5 defects/ Hour	7.7
Testing			
Write test plan (TP)	167 pages	10 pages/ Day	16.7
Review TP			
Preparation for TP		5 pages/ Hour	4.17
Review TP Meeting		10 pages/ Hour	2.08
Rework	96 defects	4 defects/ Hour	3
Execute TP (test cases)	178 test cases	10 test cases/ Day	17.8
Fix Found Defects	81 defects	5 defects/ Day	16.2
Test Fixed Defects	81 defects	8 defects/ Day	10.12
Documentation			
User Documentation	233 pages	5 pages/ Hour	5.83
Review UD			
Preparation for Review UD		5 pages/ Hour	5.83
Review UD Meeting		9 pages/ Hour	3.24
Rework	338 defects	6 defects/ Hour	7.04

- **Assumptions made in Project 3:**

1. Documented Software Development Process Updates task will start after Project Plan is completed.
2. In testing task, the Execute TP task will start after coding task is completed as well as after the Rework above the Execute TP task is completed.
3. The Analysis task is taken from Project 1 as there is no separate analysis task in project 2.
4. The Data Model task is not included in Project 3 as it is a separate task in Project 2.
5. For Coding Task, the data is given in Part 1 of Assignment 3 as Walkthrough example. I have calculated my own values of productivity rate and Amount of work of coding task and used those values in the Project 3.

- **Questions and Answers:**

Q. 7 What is the earliest finish date for this project if it is scheduled to start on 3/4/24?

Ans: The earliest finish date for this project if it is scheduled to start on 3/4/24 is 06/13/24 (MM/DD/YY format)

Project	**Start Date**	**Finish Date**	**Duration (In Days)**
Project 1	1/29/24	6/19/24	102.49
Project 2	2/12/24	9/17/24	156.22
Project 3	3/4/24	6/13/24	73.02

Q. 8 Can this project be completed 2 months after it starts? Explain why yes or no.

Ans: No, it cannot be completed 2 months after it starts as it takes 73.02 days to complete. Even though we have extra resources added in resource pool, we are a bit tight on requirement engineers and system engineers as they are working on many different tasks on all 3 projects. In this project, coding and testing task is taking more time to complete. We need more resources if we want to achieve this.

Q. 10 Submit your Comments regarding the start and completion dates and resources assignments for the three projects in a PDF document called Analysis.pdf.

Document and comment on the WBS

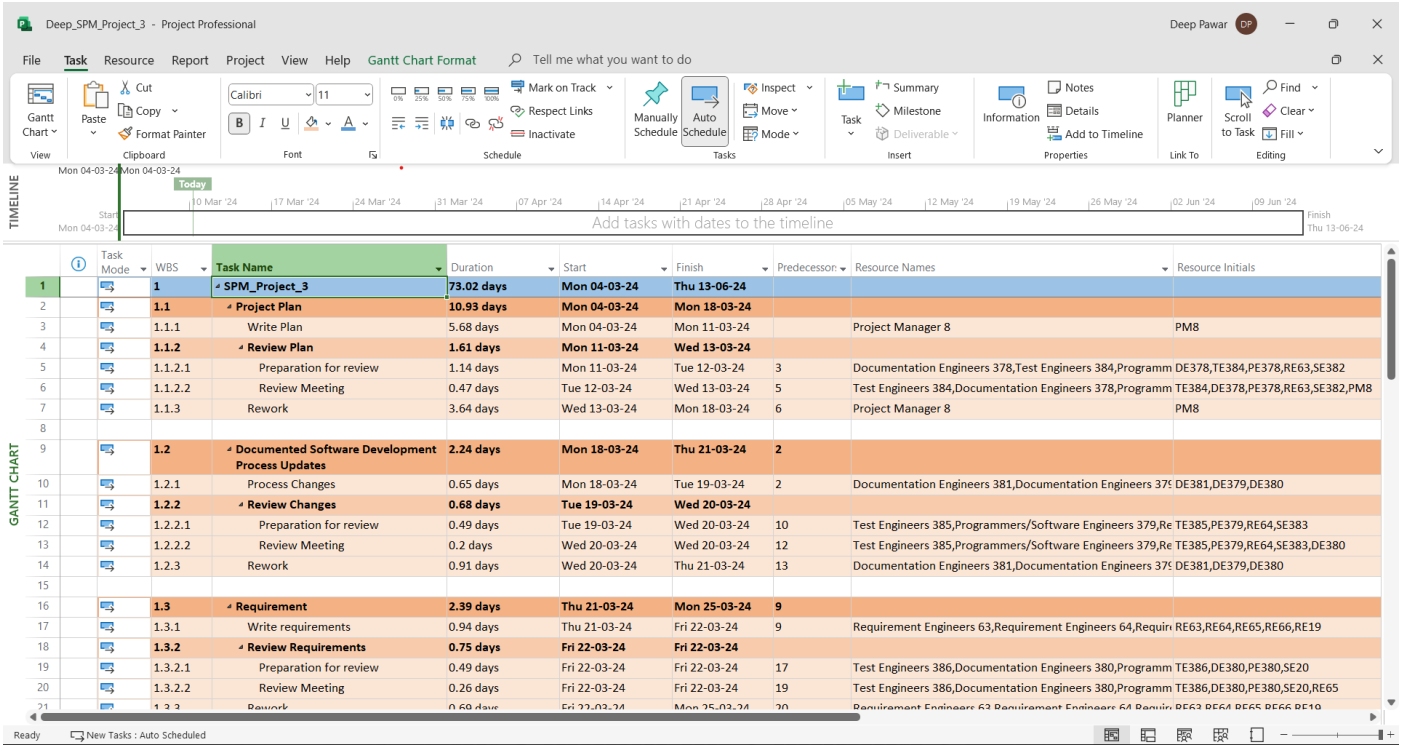
Document and comment on the Network Diagram

Document and comment on the resource pool utilization

Document the Baseline Estimation Calculations

Ans:

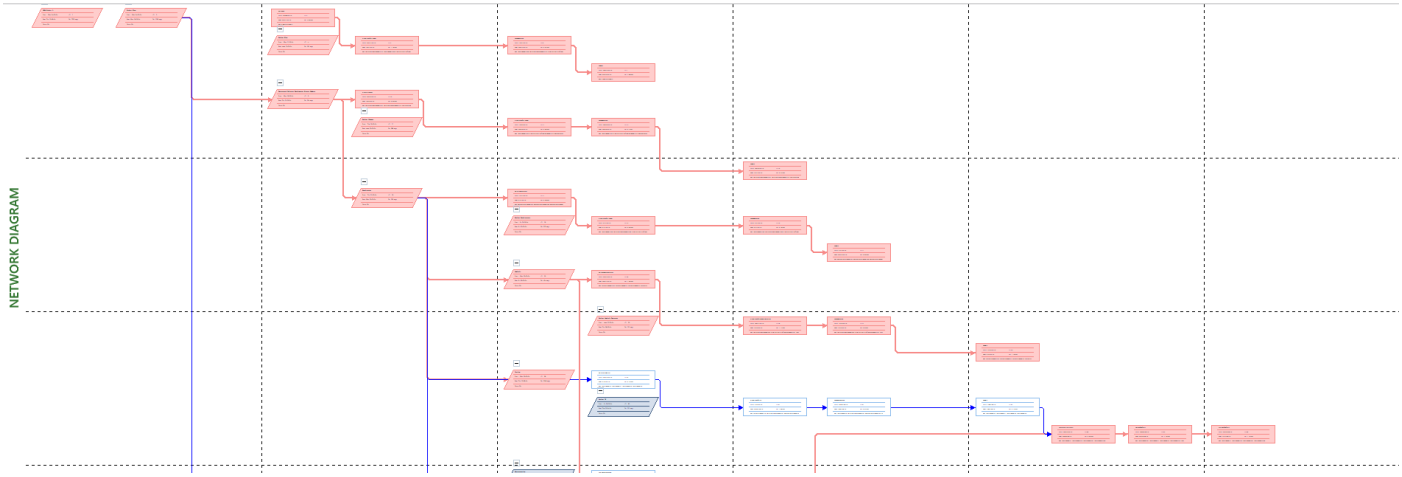
1. Gantt Chart:

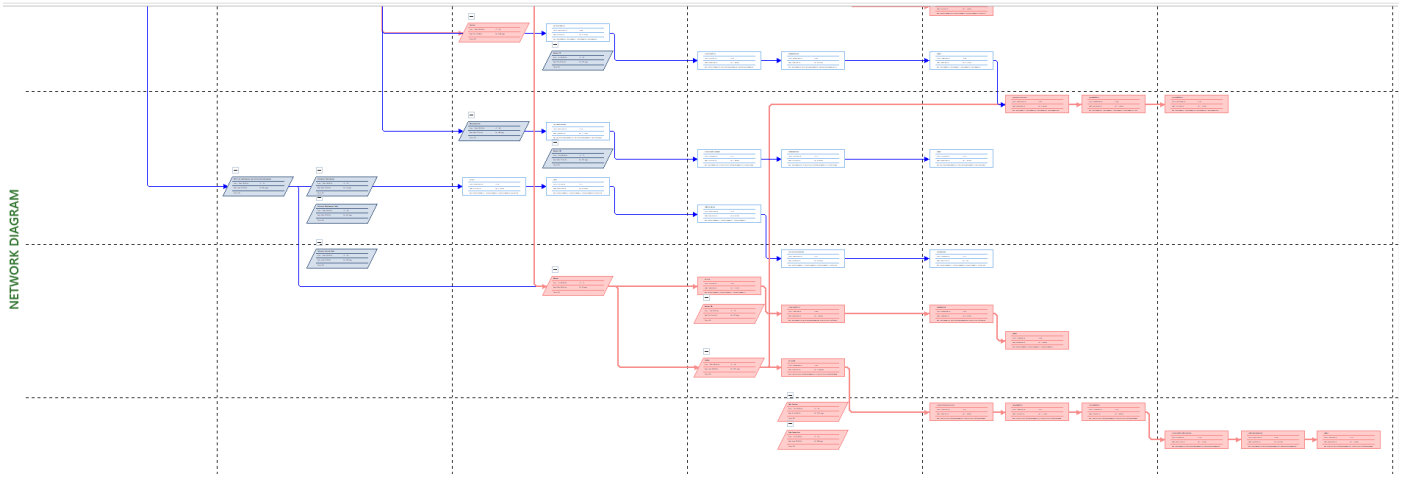


	Task Mode	WBS	Task Name	Duration	Start	Finish	Predecessors	Resource Names	Resource Initials
1		1	SPM_Project_3	73.02 days	Mon 04-03-24	Thu 13-06-24			
2		1.1	Project Plan	10.93 days	Mon 04-03-24	Mon 18-03-24			
3		1.1.1	Write Plan	5.68 days	Mon 04-03-24	Mon 11-03-24		Project Manager 8	PM8
4		1.1.2	Review Plan	1.61 days	Mon 11-03-24	Wed 13-03-24			
5		1.1.2.1	Preparation for review	1.14 days	Mon 11-03-24	Tue 12-03-24	3	Documentation Engineers 378,Test Engineers 384,Programm	DE378,TE384,PE378,RE63,SE382
6		1.1.2.2	Review Meeting	0.47 days	Tue 12-03-24	Wed 13-03-24	5	Test Engineers 384,Documentation Engineers 378,Programm	TE384,DE378,PE378,RE63,SE382,PM8
7		1.1.3	Rework	3.64 days	Wed 13-03-24	Mon 18-03-24	6	Project Manager 8	PM8
8									
9		1.2	Documented Software Development Process Updates	2.24 days	Mon 18-03-24	Thu 21-03-24	2		
10		1.2.1	Process Changes	0.65 days	Mon 18-03-24	Tue 19-03-24	2	Documentation Engineers 381,Documentation Engineers 37	DE381,DE379,DE380
11		1.2.2	Review Changes	0.68 days	Tue 19-03-24	Wed 20-03-24			
12		1.2.2.1	Preparation for review	0.49 days	Tue 19-03-24	Wed 20-03-24	10	Test Engineers 385,Programmers/Software Engineers 379,Re	TE385,PE379,RE64,SE383
13		1.2.2.2	Review Meeting	0.2 days	Wed 20-03-24	Wed 20-03-24	12	Test Engineers 385,Programmers/Software Engineers 379,Re	TE385,PE379,RE64,SE383,DE380
14		1.2.3	Rework	0.91 days	Wed 20-03-24	Thu 21-03-24	13	Documentation Engineers 381,Documentation Engineers 37	DE381,DE379,DE380
15									
16		1.3	Requirement	2.39 days	Thu 21-03-24	Mon 25-03-24	9		
17		1.3.1	Write requirements	0.94 days	Thu 21-03-24	Fri 22-03-24	9	Requirement Engineers 63,Requirement Engineers 64,Requir	RE63,RE64,RE65,RE66,RE19
18		1.3.2	Review Requirements	0.75 days	Fri 22-03-24	Fri 22-03-24			
19		1.3.2.1	Preparation for review	0.49 days	Fri 22-03-24	Fri 22-03-24	17	Test Engineers 386,Documentation Engineers 380,Programm	TE386,DE380,PE380,SE20
20		1.3.2.2	Review Meeting	0.26 days	Fri 22-03-24	Fri 22-03-24	19	Test Engineers 386,Documentation Engineers 380,Programm	TE386,DE380,PE380,SE20,RE65
21		1.3.3	Rework	0.69 days	Fri 22-03-24	Mon 25-03-24	20	Requirement Engineers 63,Requirement Engineers 64,Requir	RE63,RE64,RE65,RE66,RE19

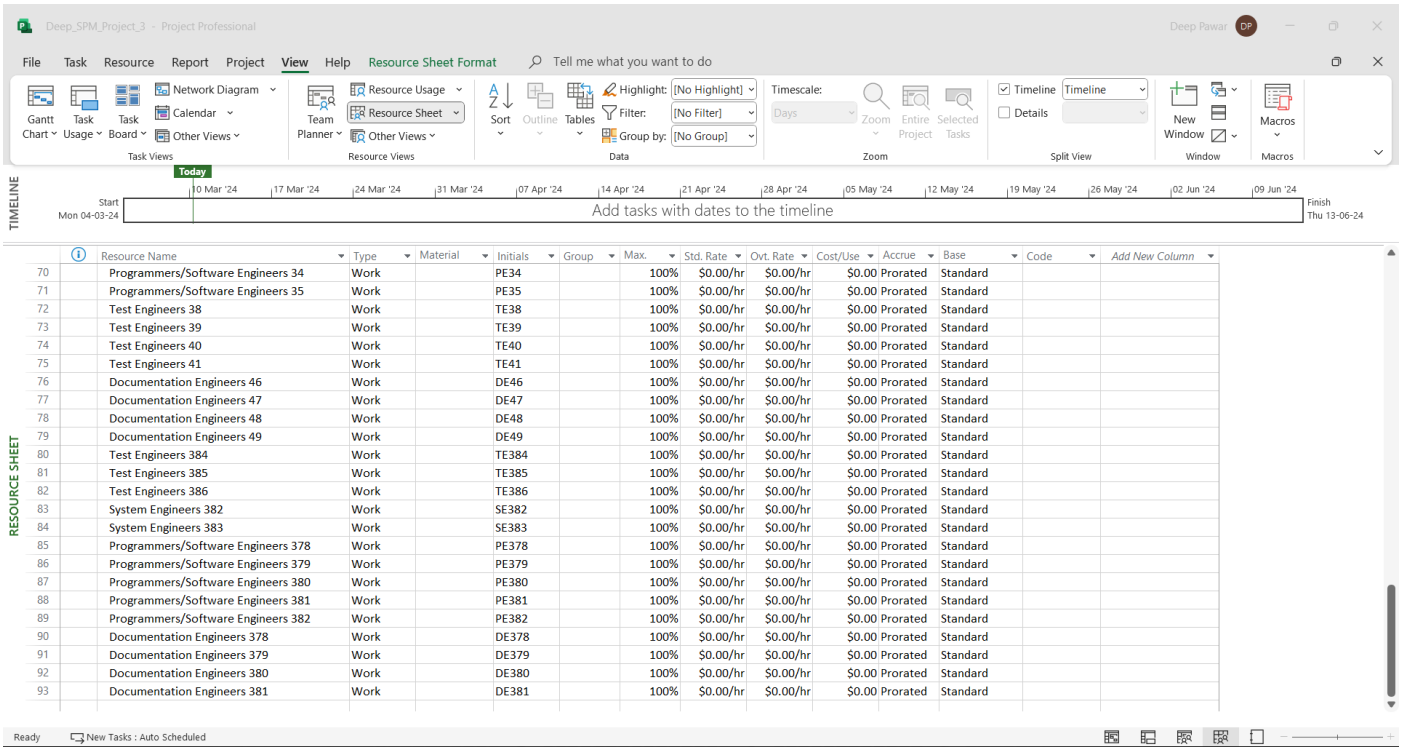
AS shown above Work Breakdown Structure (WBS) is shown to organize the tasks.

2. Network Diagram:





3. Resource pool:



	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt. Rate	Cost/Use	Accrue	Base	Code	Add New Column
70	Programmers/Software Engineers 34	Work		PE34		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
71	Programmers/Software Engineers 35	Work		PE35		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
72	Test Engineers 38	Work		TE38		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
73	Test Engineers 39	Work		TE39		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
74	Test Engineers 40	Work		TE40		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
75	Test Engineers 41	Work		TE41		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
76	Documentation Engineers 46	Work		DE46		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
77	Documentation Engineers 47	Work		DE47		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
78	Documentation Engineers 48	Work		DE48		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
79	Documentation Engineers 49	Work		DE49		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
80	Test Engineers 384	Work		TE384		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
81	Test Engineers 385	Work		TE385		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
82	Test Engineers 386	Work		TE386		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
83	System Engineers 382	Work		SE382		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
84	System Engineers 383	Work		SE383		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
85	Programmers/Software Engineers 378	Work		PE378		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
86	Programmers/Software Engineers 379	Work		PE379		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
87	Programmers/Software Engineers 380	Work		PE380		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
88	Programmers/Software Engineers 381	Work		PE381		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
89	Programmers/Software Engineers 382	Work		PE382		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
90	Documentation Engineers 378	Work		DE378		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
91	Documentation Engineers 379	Work		DE379		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
92	Documentation Engineers 380	Work		DE380		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		
93	Documentation Engineers 381	Work		DE381		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard		

New resources are added along with the connected resources of Project 1 and Project 2.