**Practice 1-Defining Calendars**

|  |  |
| --- | --- |
| **Duration:1 Hrs** | **Time taken:** |
| **Reviewed by:** |

1. Create a new base calendar that has six working days per week and 10 hours of duty time with a break of 40 minutes in between. The calendar should also include holiday on the third Saturday of the month. Check the calendar by defining few tasks with this new calendar as the project calendar.
2. Create a task calendar (Night shift) for the CCSS Company with Saturday as off; also include Independence Day and Republic Day as holidays. The task is working only in the night; the shift timing is from 9.00 pm to 7.00 am. The break in between is from 1.00 am to 2.00 am.
3. Create a three-day project calendar with normal 8 hours as working time.
4. Create a copy of 24-hour calendar and make it as a project calendar without doing any changes in the option settings.
5. Create a six-day workweek calendar with 24 hours as working time and find how the task works when the calendar is assigned to the task.
6. Create a project calendar with seven working days per week, and in the same project create a task calendar with six working days, assign it to any two tasks and check how the tasks work.

**Practice 2-Finding the Critical Path**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

Construct a network for the following data

|  |  |  |  |
| --- | --- | --- | --- |
| **Activity** | **Preceded By** | **Activity** | **Preceded By** |
| A | - | G | B, C |
| B | - | H | F |
| C | A | I | F, G |
| D | B, C | J | H, I |
| E | D | K | B |
| F | E | L | F, G, K |

**Practice 3-Finding the Critical Path**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

The precedence relationships and durations of various activities of a project are as follows. Draw the CPM network. Calculate the project duration. Find the critical path.

|  |  |  |
| --- | --- | --- |
| **Activity** | **Preceded By** | **Duration (Weeks)** |
| A | - | 3 |
| B | - | 11 |
| C | - | 9 |
| D | A | 7 |
| E | B | 9 |
| F | B | 5 |
| G | C | 5 |
| H | C | 19 |
| I | D, E | 17 |
| J | F, G | 5 |
| K | I, J, H | 3 |

Answer: Critical Path with duration 40 Weeks

**Practice 4-Finding the Critical Path**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

Estimated time (in weeks) of the job of the project is given below.

|  |  |
| --- | --- |
| **Activity** | **Duration (in weeks)** |
| A | 13 |
| B | 5 |
| C | 8 |
| D | 10 |
| E | 9 |
| F | 7 |
| G | 7 |
| H | 12 |
| I | 18 |
| J | 9 |
| K | 4 |
| L | 17 |

The constraints governing the jobs are as follows:

* A and B are start jobs; A controls C, D and E.
* B controls F and J; G depends on C.
* H depends on D; E and F control I and L.
* K depends on J; L is controlled by K.
* G, H, L and I are the last jobs.

Draw the network diagram and find out for each activity and the project duration. Determine the critical path.

**Diagram

Description automatically generated with medium confidence** Answer: Critical Path with duration 40 Weeks

**Practice 5-Finding the Critical Path**

|  |  |
| --- | --- |
| **Duration:1 Hrs** | **Time taken:** |
| **Reviewed by:** |

You and your colleagues are desires of organizing a symposium on Air Conditioning and Refrigeration. It is assumed to be a two-day program with two general lectures and about 16 paper-reading sessions. Assume that the following activities with their duration are involved.

1. Determine the minimum number of days required for preparatory work before the actual symposium can begin.
2. Determine the critical path for the network

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Activities** | | **Duration** | **Predecessors** |
| 1. | Start of project | A | 0 | - |
| 2. | Fix the dates of the symposium in consultation with the head of the institution | B | 2 | 1 |
| 3. | Formulate the theme of the symposium | C | 2 | 1 |
| 4. | Collect the names and address of the persons to whom information should be sent. | D | 4 | 1 |
| 5. | Get the brochure and technical paper request printed | E | 6 | 3 |
| 6. | Finalize the selection of two guest speakers | F | 1 | 3 |
| 7. | Send invitation to the two guest speakers. | G | 1 | 6 |
| 8. | Mail brochure and technical paper request to all persons | H | 3 | 5 |
| 9. | Collect all submitted papers | I | 45 | 8 |
| 10. | Review the paper and select the final papers to be read at the symposium. | J | 10 | 9 |
| 11. | Inform the authors about the acceptance or rejection of papers and time of presentation for accepted papers | K | 7 | 10 |
| 12. | Arrange accommodation and meals | L | 6 | 5 |
| 13. | Arrange transportation | M | 2 | 5 |
| 14. | Arrange lecture halls and public address system etc. | N | 2 | 5 |
| 15. | Prepare introductory speech | O | 1 | 11 |
| 16. | Assign duties to various volunteers | P | 2 | 14 |
| 17. | Finish of project | Q | 0 | 2,4,7,12,13,15,16, |

**Practice 6-Finding the Critical Path**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

1. Draw the network, determine float for each activity using MS Project
2. Indicate graphically the critical path alone using Gantt Chart
3. The calendar followed is 7 days workweek with 8 hours of working time. The activities E and G are working only for 5 days

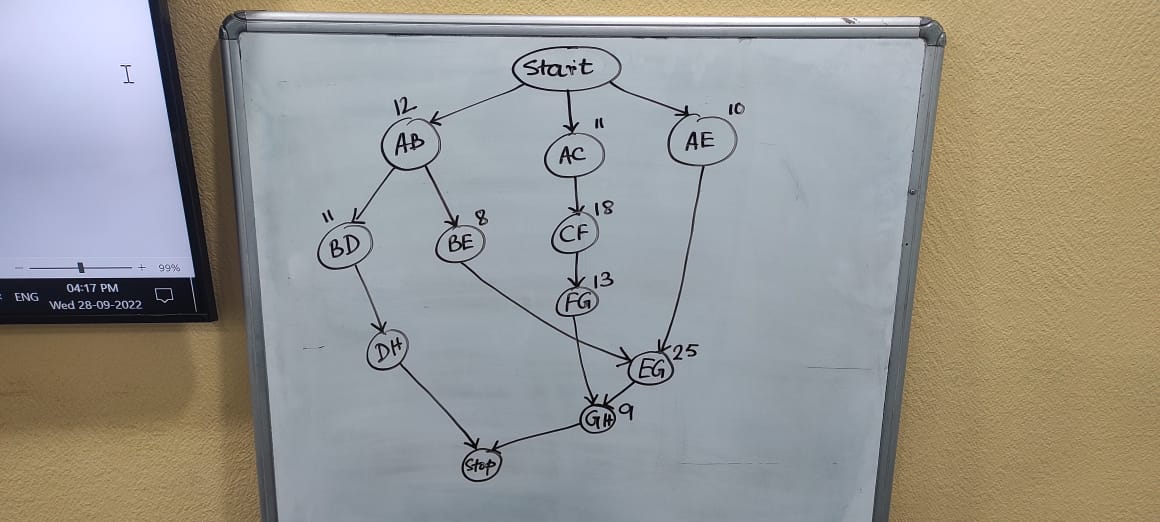
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Activity** | | **Duration (Days)** | **Predecessor** |
| 1 | Start of project | A | 0 | - |
| 2 | Clear for construction | B | 10 | 1 |
| 3 | Finalize cell site | C | 6 | 2 |
| 4 | Layout Drawings | D | 18 | 3 |
| 5 | Award civil contract | E | 8 | 4ss |
| 6 | Foundation for tower | F | 25 | 4,5 |
| 7 | Foundation for shelter | G | 15 | 6ss + 2 days |
| 8 | Foundation for DG | H | 15 | 7ss |
| 9 | Erect prefabricated shelter | I | 7 | 7,8fs+2days |
| 10 | Install anti static flooring | J | 1 | 9 |
| 11 | Erect tower | K | 15 | 6 |
| 12 | Finish of project | L | 0 | 10,11 |

**Practice 7-PERT**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

1. Draw the network diagram using PERT method and find the estimated time using optimistic, most likely and pessimistic time

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Predecessor event** | **Successor event** | **Optimistic event To** | **Most likely event Tm** | **Pessimistic event Tp** |
| A | B | 5 | 12 | 17 |
| A | C | 9 | 11 | 12 |
| A | E | 8 | 10 | 13 |
| B | D | 9 | 11 | 13 |
| B | E | 5 | 8 | 9 |
| C | F | 14 | 18 | 22 |
| D | H | 14 | 17 | 21 |
| E | G | 21 | 25 | 30 |
| F | G | 8 | 13 | 17 |
| G | H | 6 | 9 | 12 |



CP Duration of 55 or 54 Days depending on rounding, ceiling or floor calculations.

**Practice 8-PERT**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

For the project given below draw the network diagram and find estimated time (in days) and the critical path

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Task** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** | **K** |
| Least time | 4 | 5 | 8 | 2 | 4 | 6 | 8 | 5 | 3 | 6 | 6 |
| Greatest time | 8 | 10 | 12 | 7 | 10 | 15 | 16 | 9 | 7 | 11 | 13 |
| Most likely time | 5 | 7 | 11 | 3 | 7 | 9 | 12 | 6 | 5 | 8 | 9 |
| Predecessor | - | A | - | - | B, C | D | D | E, F | E, F | I, G | H |

Answer: Critical Path with duration 34 Days

**Practice 9-Outlining WBS codes**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

Using indenting and outdenting method prepare this network and apply WBS codes for the project. The calendar that is being followed is 5 days workweek with 10 hours of working time

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Id** | **Activity** | | **Duration** | **WBS Code** | **Predecessors** |
| 1 | Building project | A | - | AAA | - |
| 2 | Frame structure | B | - | AAA/01 | - |
| 3 | First floor | C | - | AAA/01/aa | - |
| 4 | Structural works | D | 66 | AAA/01/aa/11 | - |
| 5 | De-shuttering | E | 66 | AAA/01/aa/12 | 4ss+7days |
| 6 | Second floor | F | - | AAA/01/ab | - |
| 7 | Roof concreting | G | 60 | AAA/01/ab/21 | 5ss+9days |
| 8 | De-shuttering | H | 60 | AAA/01/ab/22 | 7ss+7days |
| 9 | Terrace Floor | I | - | AAA/01/ac | - |
| 10 | Starter concrete | J | 32 | AAA/01/ac/31 | 8ss+2 days |
| 11 | Column concrete | K | 32 | AAA/01/ac/32 | 10ss+2 days |
| 12 | Shuttering for roof | L | 47 | AAA/01/ac/33 | 11ss+2days |
| 13 | CBT for roof | M | 73 | AAA/01/ac/34 | 12ss+2days |
| 14 | Roof Concreting | N | 54 | AAA/01/ac/35 | 13ss+21days |

**Practice 10-Recurring tasks**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

In a fabrication project, the activities are as given below. The recurring task is taking place is the inspection of joints. The duration is in days. Draw the network diagram and find the total time taken to complete the project.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Activity** | | **Duration** | **Predecessor** |
| 1 | Start of project | A | 0 | - |
| 2 | Indenting of materials | B | 1 | 1 |
| 3 | Receiving of materials | C | 2 | 2 |
| 4 | Cutting | D | 3 | 3 |
| 5 | Fitting | E | 4 | 4 |
|  | Inspection(recurring) | F | 1hr | 2 |
| 6 | Welding | G | 6 | 5 |
| 7 | Final fitting | H | 3 | 4,6 |
| 8 | Final welding | I | 5 | 7 |
| 9 | Quality Checking | J | 4 | 8 |
| 10 | Dispatch | K | 3 | 9 |
| 11 | Closure | L | 1 | 10 |
| 12 | End of project | M | 0 | 11 |

**Practice 11-Resource Levelling**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

Add the following activities to build your network. The start of project is taken as 01/Jan/2023.

The duration is in days and the working days per week are taken as six days. Determine the total cost estimated for this project. Find the total duration for the project. Also, find whether there is any over-allocation of the resource.

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Activity Description** | **Duration** | **Predecessor** |
| **1** | **Start of project** | **0** | **-** |
| **2** | **Preparation of tender** | **20** | **1** |
| **3** | **Evaluation of technical bid** | **15** | **2** |
| **4** | **Evaluation of commercial bid** | **7** | **3** |
| **5** | **Award of contract** | **7** | **4** |
| **6** | **Ordering of equipment** | **4** | **5** |
| **7** | **Site handling over** | **7** | **5** |
| **8** | **Delivery of equipment** | **60** | **6** |
| **9** | **Erection of civil structures** | **20** | **7, 8** |
| **10** | **Erection of mechanical equipment** | **35** | **7, 8** |
| **11** | **Erection of electrical equipment** | **25** | **7, 8** |
| **12** | **Testing of plant** | **7** | **9, 10, 11** |
| **13** | **On load testing** | **7** | **12** |
| **14** | **Commissioning** | **1** | **13** |
| **15** | **End of project** | **0** | **14** |

**Resource Available**

|  |  |  |
| --- | --- | --- |
| **Resource** | **Quantity** | **Rate/day** |
| **Material Manager (MM)** | **1** | **550** |
| **Engineer (Er)** | **3** | **500** |
| **Quality Controller (QC)** | **2** | **550** |
| **Supervisor (Sr)** | **4** | **400** |
| **Office Assistant (OA)** | **1** | **200** |
| **Electrician (EI)** | **1** | **250** |
| **Labors (LB)** | **20** | **100** |
| **Crane (C)** | **1** | **450** |
| **Excavator (EX)** | **1** | **400** |
| **Cement (Cem)** | **-** | **400/bag** |
| **Sand (S)** | **-** | **3000/load** |
| **Erection Tools (Ets)** | **2** | **100** |

* **Total Duration:** 163 Days
* **Total Cost:** INR 4,93,450/-
* **Over Allocation:** Sr, OA, LB, C and Ets are overallocated.

**Resource Assignment**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **MM** | **Er** | **QC** | **Sr** | **EI** | **OA** | **LB** | **C** | **EX** | **Cem** | **S** | **Ets** |
| **2** | **-** | **1** | **-** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** |
| **3** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **4** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **5** | **-** | **-** | **-** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** |
| **6** | **1** | **-** | **-** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** |
| **7** | **-** | **1** | **-** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **-** | **-** |
| **8** | **1** | **1** | **-** | **-** | **-** | **-** | **10** | **-** | **-** | **-** | **-** | **-** |
| **9** | **-** | **1** | **-** | **2** | **-** | **-** | **15** | **-** | **1** | **200** | **2** | **1** |
| **10** | **-** | **1** | **-** | **2** | **-** | **-** | **15** | **1** | **-** | **-** | **-** | **1** |
| **11** | **-** | **1** | **-** | **2** | **1** | **-** | **10** | **1** | **-** | **-** | **-** | **1** |
| **12** | **-** | **-** | **2** | **1** | **-** | **-** | **5** | **-** | **-** | **-** | **-** | **-** |
| **13** | **-** | **-** | **1** | **1** | **-** | **-** | **5** | **-** | **-** | **-** | **-** | **-** |
| **14** | **-** | **1** | **-** | **-** | **-** | **1** | **5** | **-** | **-** | **-** | **-** | **-** |

**These are most followed ways to do resource levelling.**

* Reduce a task’s duration.
* Delay a Task.
* Split a Task.
* Adjust the resources assigned to a Task.
* Assign more resources to a Task.
* Replace an over allocated resource with an under allocated one or remove a resource.
* Adjust or contour the amount of work assigned to a resource.

**Practice 12-Trackling Progress**

|  |  |
| --- | --- |
| **Duration:30 Mints** | **Time taken:** |
| **Reviewed by:** |

The civil works related to an electrical tower erection is given as below. Draw the network diagram for the activities and progress the task as given below in the table. Set the status date after 280 days from the start of the project. Activity B is delayed by 10 days, E is by 15 days; while other tasks are executed as scheduled.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Description** | **Duration** | **Predecessor** | **Progress** |
| 1 | Start of project | 0 | - | 100% |
| 2 | Drawing/ document preparation and submission | 200 | 1 | 100% |
| 3 | Approval of drawings/ documents | 200 | 2ss + if days | 100% |
| 4 | Handing over of levelled site | 8 | 3ss | 100% |
| 5 | Soil investigation | 30 | 4 | 100% |
| 6 | Tower foundation | 190 | 5fs + 10 days | 100% |
| 7 | Equipment foundation | 170 | 6fs - 120days | 50% |
| 8 | Grouting | 31 | 7fs – 30 days | 10% |
| 9 | 33-KV tower | 46 | 8ff | - |
| 10 | Transformer foundation | 77 | 7fs-100days | 15% |
| 11 | End of project | 0 | 10 | - |