Chapter 1

Answers to Exercises:

1. Define planning and scheduling. Differentiate between the two terms.

   Answer: *Project planning i*s the comprehensive process of thinking of and preparing for the activities and actions needed to successfully complete a project. This includes but not limited to: defining scope and constraints, performing feasibility studies (financial, legal, and other), and comparing alternative designs and execution methods.

   It has also been defined as "the process of choosing the one method and order of work to be adopted for a project from all the various ways and sequences in which it could be done."

   Scheduling is the determination of the timing and sequence of operations in the project and their assembly to give the overall completion time. Scheduling takes one part of the planning effort and zooms in on it.

   Project planning serves as a foundation for several related functions such as cost estimating, scheduling, project control, quality control, safety management, and other.

2. Define a "project". What makes planning and scheduling construction projects different from general planning (Hint: think of the keywords in the definition of a project)?

   Answer: A project is a temporary endeavor undertaken to produce a unique product, service, or result.

   Two points make planning and scheduling construction projects different from general planning:

   I. Each construction project has a well-defined start point, finish point, and a scope (to be achieved within this frame of time), and

   II. There are no two identical construction projects. Each project is unique in some aspects. Differences may come from difference in location (soil type, weather conditions, labor market, building codes, unforeseen conditions, etc.), the management type and experience, or simply in different circumstances and how much Murphy's Law was involved.

3. Are the following projects? If no, make modifications that make them qualify to be projects:

   A. Repair of a broken diesel generator
   Yes, it is a project; however, you need to be careful. If the diagnosis is not done yet, then the project cannot be defined and managed well. It is recommended to do the diagnosis first, then the repair will be a well-defined project with a known (approximately) budget and schedule.

   B. Raising my two kids to be the best
   No, it is not a project. I need to set objectives like: finishing high school with a minimum set value of GPA or SAT score, being proficient in certain foreign language, getting accepted in certain colleges (and later graduate), being skillful in certain sports teams or playing musical instruments (making it to the official team or band), not having major disciplinary issues, etc. Along with this, you need to set timeline with milestones and estimate needed resources.

   C. Cooking daily for my family

No, it is not a project. Cooking specific dinner for a specific date can be a project.

D. Preparing for my son's wedding
Yes it can be a project if major things are defined (bride, date)

E. Investing in the stock market
No, it is not a project. I need to set objectives like minimum desired profit, along with constraints like amount invested, type of investment, risk level accepted. Perhaps we can also name the broker or company to deal with.

F. Periodically back up the data on my hard disk
No, it is not a project. A single backup can be a project. The continuous process can be a program.

G. Converting my garage to a play room
Yes it is a project if the design is defined, and also the budget and schedule.

4. Define a portfolio and a program in the context of project management. Give examples of each.

Answer: Author's definition: A program is a group of related projects and/or services intended to meet a common objective and usually managed by one entity. A program could also indicate a large and complex project that is divided into several projects for more effective management.

The PMI defines a program as ''a group of related projects managed in coordinated way to obtain benefits and control not available from managing them individually. Programs may include elements of related work outside of the scope of the discrete projects in the program.'' (PMBOK 2015)

A program may be temporary/one-time programs or ongoing (usually periodic/annual)

An example on a temporary program is a large development that contains several projects, e.g. infrastructure, villas, apartments, commercial, hotel, retail, etc. An example on a ongoing program is the road maintenance program in a public works department in a municipality.

A portfolio is a group of projects, not necessarily related or dependent, usually under one project manager or department. The PMI defines it as ''A collection of projects or programs and other work that are grouped together to facilitate effective management of that work to meet strategic business objectives. The projects or programs of the portfolio may not necessarily be interdependent or directly related.'' (PMBOK 2015)

An example on a portfolio is when a government agency has 200 projects and it distributes them among 20 project managers (not necessarily with equal number of projects). The group of projects that one particular project manager is responsible for, makes up his/her portfolio.

5. What is project management plan? Give an example.

Answer: PMI defines project management plan as "the document that describes how the project will be executed, monitored, controlled, and closed" (PMBOK 2017). In the previous edition of the PMBOK, it was defined as "A formal, approved document used to guide both

project execution and project control. The primary uses of the project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines. A project plan may be summary or detailed."

An example of the project management plan is when an owner plans to build a shopping strip. The plan (which could be brief or detailed, or somewhere in between) may include elements such as:

- Scope of the project (size, some info on the design, possibly with several alternatives)
- Location
- Approximate cost
- Approximate timeline (e.g. starting and ending points)
- Contracting method (e.g. fix price, cost plus)
- Delivery method (e.g. EPC, design/build)
- Potential partners (designer, contractor, PMC, etc.)
- Special considerations (legal, environmental, etc.)
- Planned method of operation

6. What is project control? Why is it important?

   Answer: The continuous process of monitoring work progress, comparing it to Baseline Schedule and Baseline Budget (what was supposed to happen or what was planned), finding any variances (deviations from baselines), where and how much; analyzing the variances to find out the causes and then taking corrective actions whenever and wherever necessary to bring the project back on schedule and within budget.

   Project control is important because things rarely –if ever- go as planned. Changes happen for various reasons and the project manager needs to keep track of progress in order to keep the project within budget and on schedule.

7. Mention a construction project you have participated in or observed. Write down the steps involved in its planning and the steps involved in its scheduling (without much specificity.)

   Many answers apply.

8. Mention the benefits of CPM (Critical Path Method) scheduling in construction projects from the contractor's perspective

   Answer:

   1) Calculate the project completion date.
   2) Calculate the start or end of a specific activity.
   3) Coordinate among trades and subcontractors, and expose and adjust conflicts.
   4) Predict and calculate the cash flow.
   5) Improve work efficiency.
   6) Serve as an effective project control tool.
   7) Evaluate the effect of changes
   8) Prove delay claims.

9. Mention the benefits of CPM (Critical Path Method) scheduling in construction projects from the owner's perspective

   Answer:

1) Get an idea on project's expected finish date
2) Ensure contractor's proper planning for timely finish
3) Predict and calculate the cash flow
4) Serve as an effective project monitoring tool
5) Evaluate the effect of changes
6) Verify delay claims

10. Do all construction projects have the same need for CPM (Critical Path Method) scheduling? Why or why not?

    Answer: No. Large and complex projects have more need for CPM scheduling. A contractor or subcontractor who is doing simple and repetitive work may not have much need for CPM scheduling. One exception is when a subcontractor is doing a simple part (say installing kitchen cabinets) for a large project, the general contractor needs to implement the subcontractor's work in the overall schedule to show timing and dependencies on others' work.

11. What are the characteristics a scheduler of a building project must have? Can the same person be a scheduler for an industrial project? Why or why not?

    Answer: The scheduler must be knowledgeable in:

    - The CPM theory and scheduling concepts,
    - The scheduling computer program he/she is using, and
    - Some knowledge in (familiarity with) the building industry.

    It is possible for the same person to be a scheduler for an industrial project; however, it would be better if the scheduler is knowledgeable in the field he/she is employed in.

12. Go to a real construction project. Meet with the project manager. Ask if they use CPM (Critical Path Method) scheduling. If they do, discuss the benefits they are getting out of scheduling. If not, ask (always politely) for the reasons they are not using CPM scheduling.

    Many answers apply.

13. Search for an article on CPM scheduling topic (ENR, Civil Engineering, and PM network magazines are good sources. Avoid scholarly journals). Summarize and discuss.

    Many answers apply.

Chapter 1: Additional questions for tests:

True or False:

1. There are no two projects in construction that are identical (from the contractor's point of view). T
2. Every construction project needs a CPM schedule. F
3. Planning and scheduling are two names for the same function. F
4. The maintenance of a large office building is considered a project. F
5. The renovation of a large office building is considered a project. T
6. Project control deals only with the money aspect of the project. F
7. Projects in a portfolio are necessarily related. F
8. Projects in a program are necessarily related. T
9. All programs have specific limited lifespan. F
10. The maintenance of city bridges can be a program. T
11. Every program has a starting point and a finishing point. F

Multiple Choices:

1. Project control is a function that takes place:
    a. Before construction begins.
    b. While construction is going on.
    c. After construction is complete.
    d. Throughout the entire process

Answer: b.

Other Questions:

1. "Attending college" may not qualify as a project for a high school student. How can you help that student in defining that goal as a project?
   Answer: Graduating from college with a certain major in a specific time can be a project. You can narrow it down more by saying "with a GPA of at least 3.0", "with $0 loans", etc.

2. If you are hiring a schedule for your company but none of the applicants has all three types of knowledge, which type you are willing to "sacrifice"? Justify your answer.
   Answer: In the author's opinion, you can sacrifice either knowledge in technical field or software but not the principles.

3. Can the following be considered as projects? If not, modify so it will qualify as a project:
    a. Lose weight and become physically fit
       Answer: No, you need to make it specific such as: Lose 50 pounds in one year, starting next month. You can add more restrictions such as using specific diet, having a specific budget, or including exercises.
    b. Become a successful businessman/woman
    c. Do full maintenance to my car
    d. Replace the carpet in my home
       Answer: Yes but also needs defining budget and timeline (start + finish)
    e. Reduce my utilities (electricity, water, cable) average bill
    f. Take a sightseeing vacation with the family

Answer: No, you need to make it specific such as: The destination, the budget, and the timeline (start + finish).

4. Project management is all about opinions… and everyone has an opinion. Is this statement accurate? Please discuss.

   Answer: Project management is an empirical / experimental science, which means people learn from practice and experience. However, not all experience is the same: While there are millions of people who had experience in project management, a small number of them are considered pioneers and leaders. They set the standards to others by introducing concepts, theories, and methods. Such leaders can be individuals or professional organizations that assemble the experts in order to optimize the opinions. The advancement and innovation in the field of project management will continue forever.

5. What are the main elements for any good scheduling system?

   Answer:

   1. The human factor: A proficient scheduler or scheduling team that understands the concepts, definitions, and applications of project scheduling and control
   2. Technology: A good scheduling computer system (software and hardware), along with capable IT support
   3. Management: A dynamic, responsive, and supportive management team that believes in the use of scheduling as part of the management effort

Chapter 2

Answers to exercises:

1. What is a bar chart? What other title does it have? Where did the other name come from?

   Answer: A bar chart is a graphical representation of project activities shown in a time-scaled bar line with no links shown between activities. It is also called Gantt chart after its first developer, Mr. Henry L. Gantt.

2. What are the main advantages of bar charts that made it so popular? What are the main disadvantages?

   Answer: Advantages are simplicity and ease of preparation and understanding. They have the capability to carry –or be loaded with- other information such as cost, manhours, or percent complete. Bar charts can also be based on CPM calculations.

   Disadvantages are lack of logical representation (relationships) and impracticality for large projects.

Questions 3-10: Many answers apply.

Chapter 2: Additional questions for tests:

True or False:

1. The bar representing a 4-day activity is twice as long as a bar representing a 2-day activity in a bar chart. T
2. Bar charts lost their popularity with the introduction of the Critical Path Method. F
3. Bars in a bar chart must be connected with relationship lines. F
4. A bar representing an activity in a bar chart may not be continuous. T
5. Bar charts and Gantt charts are two different methods of plotting construction projects' schedules. F
6. Bar charts can be loaded with information other than the timeline of the project. T
7. There is one standard way to break down the project into activities for the purpose of creating a bar chart. F

Multiple Choices:

1. Bar charts are:
    a. Simple to prepare but difficult to read.
    b. Difficult to prepare but simple to read.
    c. Difficult to prepare and Difficult to read.
    d. Simple to prepare and simple to read.

2. Bar charts can carry this info:
    a. Cost/budget ($).
    b. Manhours.
    c. Percent complete.
    d. All of the above.
    e. None of the above.

3. Bar charts display (check all that apply):
    a. Duration of the project
    b. Durations of individual activities.
    c. Sequence of activities.
    d. Relationships among activities.

4. Summary bars are:
    a. Bars with little or no information on them.
    b. Bars where each represents a group of activities or a major component of the project.
    c. A bar chart that is shrunk in size to fit a small paper size.
    d. Bars showing work on a small portion of the project only.

Answers: d, d, (a, b, and c), b.