

**Chapter 1.7 Project Management**

**Part – I: Objective type questions and answers**

1.	Project financing is one of the step of project management- State <u>True</u> or False
2.	Proposed new technologies, process modifications, equipment replacements are the elements of a) Financing    b) contracting    c) <u>technical design</u> d) Implementation
3.	The term 'energy services contract' in a project comes under a) <u>Financing</u> b) contracting    c) monitoring    d) evaluation
4.	The contractor providing financing and is paid an agreed fraction of actual savings as they are achieved is called a) Traditional contract    b) Extended financing terms c) <u>Shared savings performance contract</u> d) energy service contract
5.	The contract in which project specifications are provided to a contractor who procures and installs equipment at cost plus a mark-up or fixed price is called a) Extended Financing terms    b) guaranteed saving performance contract c) shared saving performance contract    d) <u>Traditional contract</u>
6.	The technique used for scheduling the tasks and tracking of the progress of energy management projects is called a) CPM    b) <u>Gantt chart</u> c) CUSUM    d) PERT
7.	CPM predicts the time required to complete the project– State <u>True</u> or False
8.	The time between its earliest and latest start time, or between its earliest and latest finish time of an activity is a) delay time    b) <u>slack time</u> c) critical path    d) start time
9.	The path through the project network in which none of the activities have slack is called a) start time    b) slack time    c) <u>critical path</u> d) delay time
10.	CPM provides the following benefits a) graphical view of the project b) inter-relationship among various tasks c) Predicts time required to complete the project d) <u>all the above</u>

11.	Which of the following statements about critical path analysis (CPA) is true? a) <u>The critical path is the longest path through the network</u> b) The critical path is the shortest path through the network c) Tasks with float will never become critical d) The network should remain constant throughout the project
12.	Project management technique which uses three time estimates-optimistic, pessimistic and most likely, which help in establishing the probability of completing a project within a specified time and take calculated risk before commencing a project is-----. (a) <u>PERT</u> (b) CUSUM      (c) CPM      (d) none of the above
13.	The network model that allows for randomness in activity completion times is called (a) CUSUM      (b) CPM      (c) <u>PERT</u> (d) Gantt chart
14.	The technique which suggests corrective action to be taken in the light of actual performance is ----- (a) CUSUM      (b) PERT      (c) <u>Performance monitoring</u> (d) none of the above
15.	Performance is done after implementation. State <u>True</u> or false
16.	An effective way of communicating a projects benefit usually as a part of a performance measuring and reporting process is termed as. (a) <u>Performance indicator</u> (b) CPM      (c) PERT      (d) Gantt chart
17.	In project management system, Critical Path Method CPM) allows for randomness activity completion time deterministic method while Programme Evaluation Review Technique (PERT) uses fixed time estimate for each activity. State True or <u>False</u> .
18.	In Critical Path of CPM used in project planning techniques indicates _____. a) <u>time require for the completion of the project</u> b) delays in the project c) early start and late end of the project d) none of the above
19.	Which of the following does not belongs to project planning technique? a) CPM                      b) PERT c) Gantt chart              d) <u>IRR (internal rate of return)</u>
20.	Formal project Close Out is necessary: a) On medium to large projects only                      b) <u>On all projects</u> c) Only if a project has been terminated early              d) As part of Post Project Appraisal

**Part – II: Short type questions and answers**

1.	Define the term 'project'.  A project is a one-shot, time limited, goal directed, major undertaking requiring the commitment of varied skills and resources.
----	--

<p>2.</p>	<p>List various steps in project management. The various steps in project management are:</p> <ul style="list-style-type: none"> <li>a) Project definition and scope</li> <li>b) Technical design</li> <li>c) Financing</li> <li>d) Contracting</li> <li>e) Implementation</li> <li>f) Performance monitoring</li> </ul>
<p>3.</p>	<p>List the external source of funds during financing stage in project management. External sources of funds include:</p> <ul style="list-style-type: none"> <li>➤ Bank loans</li> <li>➤ Leasing arrangement</li> <li>➤ Payment by savings ( a deal arranged with equipment supplier)</li> <li>➤ Energy services contract</li> <li>➤ Private finance initiatives</li> </ul>
<p>4.</p>	<p>List the elements to be considered during technical design of a project management.</p> <ul style="list-style-type: none"> <li>a) Proposed new technologies, process modifications, equipment replacement and other measures included in the project.</li> <li>b) Product / technology / material supply chain (sourcing of vender from domestic or international with reliability of supply)</li> <li>c) Commercial viability of the complete measures (IRR, NPV, etc.)</li> <li>d) Special technical complexes (installation, maintenance, repair), associated skills required.</li> <li>e) Preliminary designs, including schematics along with design requirements, manufacturer name and contact details and capital cost estimates.</li> <li>f) Organisational and management plan for implementation including time table, personal requirements, staff training, project engineering and other logistical issues.</li> </ul>
<p>5.</p>	<p>While screening the projects, list the criteria used to rank-order project opportunities.</p> <ul style="list-style-type: none"> <li>a) Cost effectiveness of energy savings of complete package of measures (IRR, NPC, Cash flow, payback period)</li> <li>b) Sustainability of savings over life of the equipment</li> <li>c) Ease of quantification, monitoring and verifying electricity and fuel savings</li> <li>d) Availability of technology and ease in adoptability to Indian condition.</li> <li>e) Other environmental and social benefits (such as reduction in emissions and pollutants)</li> </ul>

6.	<p>What are the different types of contracts involved in project management system.</p> <ul style="list-style-type: none"> <li>➤ Traditional contract</li> <li>➤ Extended technical guarantee/service</li> <li>➤ Extended financing terms</li> <li>➤ Guaranteed savings performance contract</li> <li>➤ Shared savings performance contract</li> </ul>
7.	<p>Briefly explain guaranteed saving performance contract.</p> <p>Guaranteed Saving Performance Contract is a contract, where all or part of savings is guaranteed by the contractor, and all or part of the costs of equipment and/or services is paid down out of savings as they are achieved.</p>
8.	<p>Briefly explain shared saving performance contract.</p> <p>Shared Savings Performance Contract is the contractor, which provides the financing and is paid an agreed fraction of actual savings as they are achieved. This payment is used to pay down the debt costs of equipment and/or services.</p>
9.	<p>List guidelines used during implementation stage of projects?</p> <ul style="list-style-type: none"> <li>➤ Limit long lead times</li> <li>➤ Manage out-of-pocket development by focusing efforts</li> <li>➤ Manage project carefully</li> </ul>
10.	<p>List the main points that are most important to a successful project</p> <ol style="list-style-type: none"> <li>a) A project must meet customer requirements</li> <li>b) A project must be under budget</li> <li>c) A project must be on time</li> </ol>
11.	<p>List the steps involved in CPM project planning?</p> <p>Steps in CPM Project Planning</p> <ol style="list-style-type: none"> <li>1. Specify the individual activities.</li> <li>2. Determine the sequence/interrelationships of those activities.</li> <li>3. Draw a network diagram.</li> <li>4. Estimate the completion time for each activity.</li> <li>5. Identify the critical path (longest path through the network)</li> <li>6. Update the CPM diagram as the project progresses.</li> </ol>
12.	<p>What are the benefits of CPM.</p> <p>CPM provides the following benefits:</p> <ul style="list-style-type: none"> <li>• Provides a graphical view of the project.</li> <li>• Depicts the interrelationships among various tasks/activities</li> <li>• Predicts the time required to complete the project.</li> <li>• Shows which activities are critical to maintaining the schedule and which are not.</li> </ul>

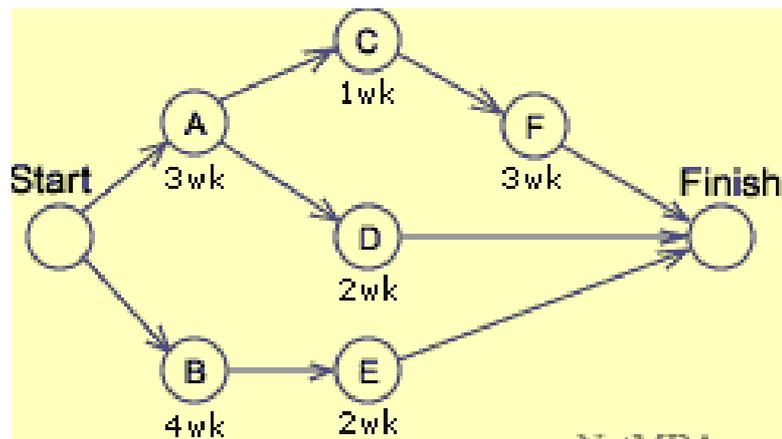
13.	<p>Define briefly PERT</p> <p>The <i>Program Evaluation and Review Technique</i> (PERT) is a network model that allows for randomness in activity completion times. PERT uses three time estimates-optimistic, pessimistic and most likely, which help in establishing the probability of completing a project within a specified time and take calculated risk before commencing a project. It has the potential to reduce both the time and cost required to complete a project.</p>
14.	<p>What are the different steps involved in PERT planning?</p> <p>PERT planning involves the following steps:</p> <ol style="list-style-type: none"> <li>1. Identify the specific activities and milestones.</li> <li>2. Determine the interdependencies and proper sequence of the activities.</li> <li>3. Construct a network diagram.</li> <li>4. Estimate the time(three time estimates, if probabilities are to be computed) required for each activity.</li> <li>5. Determine the <i>critical path</i>.</li> <li>6. Update the PERT chart as the project progresses.</li> </ol>
15.	<p>What are the benefits of PERT.</p> <p>PERT is useful because it provides the following information:</p> <ul style="list-style-type: none"> <li>• Expected project completion time.</li> <li>• Probability of completion before a specified date.</li> <li>• The critical path activities that directly impact the completion time.</li> <li>• The activities that have slack time and that can lend resources to critical path activities.</li> <li>• Activity starts and end dates.</li> </ul>
16.	<p>How performance monitoring in project management is useful? List the benefits.</p> <p>Once the project is completed performance review should be done periodically to compare actual performance with projected performance. A feedback device, it is useful in several ways:</p> <ol style="list-style-type: none"> <li>a) It throws light on how realistic were the assumptions underlying the project</li> <li>b) It provides a documented log of experience that is highly valuable in future decision making</li> <li>c) It suggests corrective action to be taken in the light of actual performance</li> <li>d) It helps in uncovering judgmental biases</li> <li>e) It includes a desired caution among project sponsors.</li> </ol>
17.	<p>List the project planning techniques used in project management.</p> <p>Gantt chart, Critical path method (CPM), Programme evaluation review techniques (PERT).</p>

18.	<p>What is slack time in critical path in CPM?</p> <p>The <i>slack time</i> for an activity is the time between its earliest and latest start time, or between its earliest and latest finish time. Slack is the amount of time that an activity can be delayed past its earliest start or earliest finish without delaying the project.</p>
19.	<p>List the internal source of funds during financing stage in project management.</p> <p>Internal sources of fund include:</p> <ul style="list-style-type: none"> <li>➤ Direct cash provision from company reserves</li> <li>➤ From the revenue budget (if pay back period is very attractive and less than a year)</li> <li>➤ New share capital</li> </ul>
20.	<p>Explain the need for measurement and verification in a project management system</p> <p>Facility energy savings are determined by comparing the energy use before and after the installation of energy conservation measures. The “before” case is called the baseline; the “after” case is referred to as the post-installation or performance period. Proper determination of savings includes adjusting for changes that affect energy use but that are not caused by the conservation measures. Such adjustments may account for differences in capacity utilization, raw material quality, product mix and other parameters, between the baseline and performance periods.</p> <p>In general,</p> <p>Savings = (Baseline Energy use) adjusted – Post-installation Energy use</p> <p>For example in a paper mill a variety of products depending on thickness (Grams per Square meter) are made. If energy consumption is evaluated as kCals or kWh per tonne of paper the figures could be misleading. Under these circumstances the measurement and verification system is to be designed accounting for these variations</p>

**Part – III Long type questions and answers**

1.	<p>Briefly explain steps in project management.</p> <p>a) Project definition and scope: The first step in project development cycle is to identify components of the project. Projects may be identified both internally and externally. Next screening of the projects is used to rank older project opportunities.</p> <p>b) Technical design: Once project makes its part the screening process, the hard work of developing technical specification begins. For a project to be considered a viable investment, its proponent must present a sound technical feasibility.</p> <p>c) Financing: The funding for a project is often outside the control of the project manager. However, it is important that one should understand the principles behind the provision of scarce funds. Project funds can be obtained from either internal or external sources.</p> <p>d) Contracting: Substantial portion of a project is typically executed through contracts, the proper management of contracts is critical to the successful implementation of a project. If the project is to be implemented by an outside contractor several types of contracts may be used to undertake the installation and commissioning.</p> <p>e) Implementation: Implementation stage involves the execution of project as agreed whilst carefully monitoring the progress and managing changes. On energy efficiency projects the main issues are technology selection risk, the overall risk sharing criteria is the installation contract, structure and relationship with sub-contractors and enforcing penalties among parties.</p> <p>f) Project monitoring techniques: there are variety of basic planning and monitoring</p>
----	--

	<p>techniques. All monitor progress and costs against resource budgets. Some of them are Gantt charts, CPM (critical path method), program evaluation and review techniques.</p>
2.	<p>What are the several types of contracts used in project management and explain in brief?</p> <ul style="list-style-type: none"> <li>• <b>Traditional Contract:</b> All project specifications are provided to a contractor who procures and installs equipment at cost plus a mark-up or fixed price.</li> <li>• <b>Extended Technical Guarantee/Service:</b> The contract offers extended guarantees on the performance of selected equipment, and/or offers service/maintenance agreements.</li> <li>• <b>Extended Financing Terms:</b> The contractor provides the option of an extended lease or other financing vehicle in which the payment schedule can be based on the expected savings.</li> <li>• <b>Guaranteed Saving Performance Contract:</b> All or part of savings is guaranteed by the contractor, and all or part of the costs of equipment and/or services is paid down out of savings as they are achieved.</li> <li>• <b>Shared Savings Performance Contract:</b> The contractor provides the financing and is paid an agreed fraction of actual savings as they are achieved. This payment is used to pay down the debt costs of equipment and/or services.</li> </ul>
3.	<p>How critical path can be identified in CPM?</p> <p>The critical path can be identified by determining the following four parameters for each of the activity:</p> <ul style="list-style-type: none"> <li>• ES - earliest start time: the earliest time at which the activity can start given that its precedent activities must be completed first.</li> <li>• EF - earliest finish time, equal to the earliest start time for the activity plus the time required to complete the activity.</li> <li>• LF - latest finish time: the latest time at which the activity can be completed without delaying the project.</li> <li>• LS - latest start time, equal to the latest finish time minus the time required to complete the activity.</li> </ul> <p>The <i>slack time</i> for an activity is the time between its earliest and latest start time, or between its earliest and latest finish time. Slack is the amount of time that an activity can be delayed past its earliest start or earliest finish without delaying the project. The critical path is the path through the project network in which <b>none of the activities have slack, that is, the path for which ES=LS and EF=LF for all activities in the path.</b></p>
4.	<p>What is CPM and list the steps in CPM project planning?</p> <p>CPM models the activities and events of a project as a network. Activities are depicted as nodes on the network and events that signify the beginning or ending of activities are depicted as arcs or lines between the nodes. The following is an example of a CPM network diagram.</p>



**Steps in CPM Project Planning**

1. Specify the individual activities.
2. Determine the sequence/interrelationships of those activities.
3. Draw a network diagram.
4. Estimate the completion time for each activity.
5. Identify the critical path (longest path through the network)
6. Update the CPM diagram as the project progresses.

**5. Explain and draw a typical Gantt chart**

Gantt chart (named after the inventor) or bar charts are used to scheduling the tasks and tracking of the process of energy management projects. Gantt scheduling tool takes the form of a horizontal bar graph on a time schedule.

Task	Duration	1 week	2 week	3 week	4 week	5 week	6 week	7 week
1. Preliminary audit and report	1 week							
2. Identification of external consultants and obtaining the proposals	2 weeks							
3. Selection of auditor and awarding contract	1 week							
4. Detailed energy audit , field study & report preparation	4 weeks							

The horizontal axis of the Gantt chart is a time scale either in absolute time or in relative time. Rows of bars in the chart show the beginning and ending dates of individual tasks in the project. In some cases bars/activities may overlap, where several activities can be performed in parallel. In such cases Gantt chart is quite useful for communicating the timings of the various tasks.

For larger projects, the tasks can be broken into sub tasks having their own Gantt charts to maintain readability and provide easy monitoring.