

CEP EXAM QUESTIONS AND ANSWERS

1- What is estimating?

A prediction or forecast of resources (Time, Cost and Materials) required to achieve or obtain an agreed upon scope.

2- What is the role of a cost estimator?

- Predict cost of a project for a defined scope, to be completed at defined location and point in time in future.
- Assists in economic evaluation of potential projects.
- Collect and analyze data.

3- What is budgeting?

A process used to allocate the estimated costs of resources into cost accounts against which cost performance will be measured and assessed. Budgeting considers time-phase in relation to a schedule and/or time based financial requirements and constraints.

4- What is quantification?

Activity to translate project scope information into resource quantities suitable for costing.

5- What are the different classes of estimate?

Class – 5 conceptual/screening – factored/parametric.

Class – 4 Study/Feasibility – equipment factored/parametric.

Class – 3 Budget/Authorizing/Control – semi detailed line items.

Class – 2 Control/Bid Tender – detailed unit costs/ forced take off

Class – 1 Check estimate – detailed take off

6- What is costing?

Costing is the application of cost and resources to a quantified scope.

7- What is pricing?

The determination of the amount of money asked in exchange for the item, it is applied after costing and its determination takes in consideration; business and other considerations in addition to inherent costs.



8- What are the fundamental considerations for internalization?

Converting units from other measurement systems, calculate the effects of changes in currency exchange rates and adjust labor productivity.

9- What is accuracy?

It is an indication of the degree to which the final cost outcome for a given project will vary from the original estimate cost.

10- What is contingency?

It is an amount added to an estimate to allow for items, conditions or events for which the state occurrence or effect is uncertain and that experience shows will likely result in additional costs.

11- What is parametric estimate?

Is the process of estimating cost by using mathematical equations that relate cost to one or more physical variables associated with the item being estimated.

12- What is Cost Estimate Relationship (CER)?

It is an algorithm or formula that is used to perform the costing operation. CER's relate (Cost, Time, and Quantity) with quantity scope, execution strategies or other defining elements.

13- What are location factors?

An overall total project factor for translating the summation of all project cost elements from a geographical location to another.

14- What are life cycle costs?

Consideration of all costs of a product, from concept, design, implementation, start up and dismantling.

15- What are direct costs?

The costs related to completing work that are directly attributable to its performance and are necessary for its completion. It includes the supervision directly involved in the physical construction.

16- What are indirect costs?

The cost not directly attributable to the completion of an activity, typically allocated across all activities on a predetermined basis.

17- What is Lang factor method?

It is a technique proposed by H. J. Lang. Lang suggested multiplying the cost of the equipment by a factor (Lang Factor) to obtain total process plant cost.

Total plant Cost = Total equipment cost x Lang factor



18- What is Hand factor method?

Hand factor method uses different factor for different types of equipment. Different from Lang factor method when the cost of the equipment are multiplied by its factors we obtain the direct field costs. Indirect field costs, home office costs and OSBL costs are excluded from the final result.

Direct field Cost = Equipment cost x Hand factor

19- What is the difference of “composite rate” and “average crew rate”?

They are the same and consist in develop an average rate between crafts of different experiences and wage rates.

20- What is burden?

It is the cost of maintaining an office with staff, other than operating personnel. Also includes federal, state and local taxes, fringe benefits and other union contract obligations.

21- What is bare rate?

Bare labor rate is the gross direct wage paid to the workers.

22- What is unbalance estimate technique?

It is a technique used to allocate estimate costs to accounts whose definitions do not reflect the nature of the cost being allocated. The objective is to achieve a desired business result, such improve cash flow.

23- What are the estimate process steps?

Scoping

Quantification

Costing

Pricing

Conditioning

24- What KSA stands for?

Knowledge, skills and abilities.

25- What is cost category?

A division in a system of classification for estimated and expensed money for which cost are to be summarized.

26- Why estimate classifications are important?

Because they assist all parties in gaining a mutual understanding of the basis of the estimate, as well as the expected accuracy of the estimate.



33- What is schedule of values?

A detailed statement, furnished by contractor, breaking down the contract value into work packages. It is used as basis for submitting and reviewing progress payments.

34- What is production rate?

It is the amount of work that may be accomplished in a given unit of time.

35- What is the best way to record labor on a database and why?

The production rate is the best way to record cost in a database, because they are relatively constant for any given location.

36- What are the inputs to the cost estimating process?

Scope definition, historical cost information and schedule information.

37- Why standards and cost estimate terminology are important?

To promote consistent communication, vital for the diverse stakeholders to have a common understanding of terms.

38- What are the most important characteristics used to categorize cost estimates?

- Maturity level of project definition deliverables.
- End usage of the estimate.
- Estimate methodology.
- Effort and time needed to prepare the estimate.

39- What is the difference between stochastic and deterministic methodology?

- Stochastic – Use something other than a direct measure of an item being estimated as independent variable, this method is based in factors, metrics and models.
- Deterministic – The independent variable is a definitive measure of the item being estimated, it may include quotes and bids.

40- List 6 risks that affects estimate accuracy.

- Unfamiliarity with process technology.
- Complexity of the project.
- Quality of cost historical data.
- Experience and skill level of the estimate.
- Estimate techniques employed.
- Time and level of effort used to develop estimate.



41- Estimate variability is affected by 3 items, what are them?

Estimate variability is function of scope or quantity and cost, price is the third one usually independent of the other two.

42- How type of contract may affect estimate variability?

One of the primary cause of estimate variability is risk, therefore the type of contract chosen will expose the contractor to different risk levels. A lump sum contract is risky than a cost plus contract, for example.

43- What are estimating algorithms and when they are most used?

Algorithms are an effective method for solving problems, generally used in the development of conceptual estimates before detailed drawings and specifications are available.

44- What are the codes of accounts (COA) and their use?

A systematic coding structure for organizing and managing scope, asset, cost resource, work and schedule activity information. A code of account is an index to facilitate, finding, sorting, comparing, summarizing, or otherwise managing information that the code is tied to. A complete code of account includes definitions of content of each account. Code of accounts by nature are intended to reduce confusion.

45- What should be prioritize when defining the basic structure of a code of account?

The code of account basic structure should prioritize:

- User and costumer needs.
- Consider long term and external consequences.
- Consider intra and intercompany standardization.

46- Which team is the best to manage a code of account and what should be avoided on a code of accounts management?

A cross functional team is the best to manage a code of account. Individual users should not be permitted to make arbitrary changes.

47- What are the code of account characteristics that increases it usability and improves clarity?

A well-defined and clear structure and format increases usability. Organize all elements in a reference dictionary or similar document improves clarity.

48- What are the two benefits of a long term standardization?

Allows benchmark between peer companies and allows comparison with other projects.



49- What are the benefits of code of accounts usage?

- Classifying estimate items for cost control.
- Facilitates estimate and analysis of project cost data.
- Summarizes cost data.
- Comply with accounting, taxation and regulatory requirements.
- Categorize performance and productivity measurements and analysis.
- Simplify cost and schedule forecast.
- Facilitates audits and reporting accuracy.

50- What are the main characteristics and applications of masterformat?

- Widely used among construction and government contracting industries.
- Engineering and other indirect costs are not primary considerations.
- It is not very effective for process industries once does not emphasize equipment, piping etc.

51- What is uniformat and where it is best used?

It is another format that is related to masterformat. It combines the accounts into a system orientation that is particularly useful for conceptual estimating.

52- What financial ledger account is used for?

They are used to record, classify and summarize business financial transaction. It helps to determine the overall financial state of a business.

53- On a financial ledger which account capture cost of projects that are underway?

The “work in progress” account is used to capture the cost of projects that are underway. After the project is completed the costs are transferred to other assets accounts.

54- What the estimator must do before use an estimate commercial database that has been acquired by the company?

- Evaluate the database basis.
- Validate the data.
- Calibrate the data to the specific use

55- How internationalization can affect estimate?

- Different cultures affects work regulations.
- Holidays and customs
- Variations in currency.
- Taxes system.



56- Why the estimate process must be planned before it begun?

- To understand its objective, so the estimate will meet those objectives.
- Match time and effort level with the estimate process to be used.
- Determine the appropriate estimate classification.
- Make sure all estimate requirements have been match.
- Ascertaining the use and purpose of the estimate.
- Identify resources to develop the estimate.
- Define what will be counted, units of measure and estimate organization.

57- What an open shop project refers to?

Refers to a condition where union and/or non-union workers may be working.

58- What are the benefits of the appropriate estimate methodology selection?

Guarantee that estimating process will meet budget and schedule requirements and project objectives.

59- What is the end product method?

It is a conceptual estimating method, it relates the end product unit (Capacity Unit) of a past project to a new one that is being estimated. Example: Construction cost of a hotel based on the total number of guest room of the hotel.

60- What is physical dimensions method?

Similar to end product method, it uses the physical dimensions of the item being estimated as the driving factor to calculate the cost. Note that economies of scale and differences on the building are ignored.

61- What is capacity factor method?

It is the method in which the cost of a new facility is derived from the cost of a similar facility of a known capacity.

$$\frac{\text{Capacity A}}{\text{Capacity B}} = \left(\frac{\$ \text{Plant A}}{\$ \text{Plant B}} \right)^e \quad e = \text{capacity factor}$$

62- What are the key steps in preparing capacity factor estimate?

- Deduct cost from the known base case that are not applicable in the new plant.
- Apply location and escalation factors.
- Apply capacity factor algorithm to adjust plant size.
- Add any required costs on the new plant but which are not included in the known plant.

63- What are ratio factor methods?

They are the ones used in situations where the total cost of an item of facility can be reliably estimated from the cost of a primary component. Example: Lang Factor and Hand Factor.



64- What are the 3 main factors that affect equipment material costs to a greater degree than they affect the bulks?

In accordance to Arthur Miller they are: size, material of construction, operating pressure.

65- What are parametric methods?

They are mathematical representation of cost relationship that provide a logical and predictable correlation between physical characteristics of a plant and its resultant cost.

66- When parametric methods are most useful?

On early conceptual estimates when there is little technical data or engineering deliverables available.

67- What are the steps of parametric model development process?

- Cost model scope determination.
- Data collection.
- Data Normalization
- Data analysis.
- Data application.
- Testing
- Documentation.

68- What are the steps of a detailed estimate development process?

- Prepare project estimate basis and schedule.
- Prepare direct field costs estimate
- Prepare indirect field costs estimate
- Prepare home office costs estimate
- Prepare sales taxes and duties estimate.
- Prepare escalation estimate.
- Prepare project fee estimate (applicable for contractors).
- Prepare risk analysis and contingency determination.
- Review and validate estimate.

69- What is takeoff?

It is a specific type of quantification that is a measurement of materials and labor required for a project.

70- How can we improve the takeoff process efficiency?

It can be improved if standard estimating guidelines are established and followed.

71- What is bill of materials (BOM)?

It is a detailed quantity takeoff produced in order to facilitate procurement for a project or product.

72- What are the 3 general basic measurement undertaken during quantification?

Count, length and area.

73- What is demurrage?

It is an ancillary cost that represents liquidated damages for delays. It occurs when the ship is preventing from loading/unloading within the stipulated lay time.

74- What is idle construction equipment rental rate?

It is the cost of the equipment that remains on site ready for use but is placed in standby basis. It is the same as stand by rate.

75- What is included on standby rate?

Some proportion of ownership cost but not operating labor or fuel maintenance costs.

76- What are exempt employees?

They are employees not covered by the minimum wage and overtime provisions of the US fair labor standards (FLSA). Exempt employees don't receive overtime compensation by federal wage and hours guidelines.

77- What the term "field costs" refers to?

It refers to the engineering and construction costs associated with the construction site rather than with the home office costs.

78- What are base wage or bare wages?

It is the amount of dollars that goes directly to the employee.

79- List 3 examples of fringe benefits

Pay time off (PTO), Medical and life insurance, government mandated benefits.

80- What is fully loaded or billing rate?

It is the base salary plus adders that will be paid for an hour work on the job.



81- What are the inputs for pricing process?

- Individual item costs.
- Knowledge of the organizations overhead costs.
- Knowledge of profit requirements.
- Knowledge of how the current conditions is affecting the competitive market situation.

Bad Market situation.	
Company need Jobs.	
Lower Profit	
Price	Profit
	Overhead
	Cost
Good Market situation.	
Higher Profit.	
Price	Profit
	Overhead
	Cost

82- Examples of indirect field costs?

- Small tools
- Field supervision
- Construction equipment.
- Trailers.

83- What the term “deflation” refers?

A persistent decrease in the level of costumer prices, or a persistent increase in the purchasing power of money caused by a decrease in available currency and credit relative to the proportion of available goods and services.

84- What are the most common pricing strategies?

- Type 1, the goal is to win the job and execute it profitably.
- Type 2, refers to a new industry that a company is trying to get a foothold into. Profit may not be as important as obtain a new business acquisition.

85- Some information about Return of investment (ROI).

- Simple ROI works when gains and investments are easily known.
- It says nothing about magnitude of returns or risk in the investment.
- When comparing alternatives higher ROI is the best option.

86- What is return on sales (ROS)?

It compares after taxes profits to sales. It can help you determine if you are making enough of a return on your sales effort. If ROS is decreasing over time it could be a signal that you will soon be experimenting financial problems.



87- What is gross profit margin ratio?

It indicates how efficiently a business is using its materials and labor in the production process. This ratio tells you if you are pricing your goods or services properly.

88- What is break even analysis?

Involves finding the level of sales necessary to operate a business on a break even basis, what means: total cost equal total revenue.

89- What is conditioning?

Is to prepare an estimate for a given purpose or set of conditions. Another good term to describe conditioning would be "adjusting the estimate".

90- Some information about Risk Management.

- One of the greatest project risks is the lack of adequate planning.
- Risk management will develop methods to deal with both anticipated and unanticipated events.
- Risk management must maximize areas where we have control and minimize areas where we don't have control.

91- What is the risk management process sequence?

Risk identification – Risk assessment – Risk Analysis – Risk Mitigation.

92- What are the two documents that are essential to establish what will be covered by the risk management process?

A mission statement and the scope of work.

93- What is the objective of risk assessment?

Establish the relative importance and impact of the risk items. Each risk should be assessed and the probability of occurrence and a potential impact is defined.

94- What is the objective of risk analysis?

The main objective is the selection of risk items for mitigation.

95- When the occurrence/impact matrix is used?

During risk analysis.

96- Describe the following risk mitigations, avoidance and prevention.

- Avoidance, restructure the project to avoid the risk.
- Prevention, may reduce the risk factors so that the risk do not occur or the severity is reduced.



97- Describe the following risk mitigations, transfer and hedging.

- Transfer, transfer the risk to another company that is more competent or willing to accept the risk.
- Hedging, specialized part of transfer where risk of price fluctuation is assumed by a speculator through the purchasing and selling of future contracts.

98- How can we make risk management most effective?

Monitoring, controlling and adjusting the whole project life cycle.

99- What are sensitive analysis and decision tree analysis?

Sensitive analysis, is the process of substitute variables in a model to test the effects of this changes.

Decision tree, method to evaluate and compare the probabilities and financial results of investment choices.

100- Why the estimate documentation must be detailed, organized and archived?

Because estimates create strong budget and performance expectations. Clients will hold the organization accountable in providing estimates that are consistent with the project design and accuracy of estimates will be a factor in determining organization financial success.

101- What is estimate reconciliation process?

Is the process of resolving variances between two estimates developed based on the same scope. It identifies any cost differences due to scope changes, pricing or risks between the two estimate versions.

102- How estimate reconciliation can help development of historical database?

Applying reconciliation process between the estimate and the final cost of the project.

103- Information: Estimate reconciliation process should take place with the estimate, as well as all supporting documentation, including BOE, schedule and risk assessment. Use of a table of variances will help the process to compare quantities and costs between estimates.

104- What is an estimate variance report?

It is the document that describe any differences in pricing, scope or risk between two estimates.

105- What is a benchmark report?

It is a document that compares cost of similar projects and provides a context for the estimate.

106- Where the management reserves specific purpose and use for which is intended must be clearly documented?

It must be documented on the Basis of Estimate (BOE).



107- What is estimate close out?

It consist in verifying final actual project costs and organize those costs for entry into the organization's historical cost database.

108- What is the typical evolution of an estimate during its process?

- Conversion the scope into measurable elements.
- Incorporation of those quantities into a draft estimate.
- Development of resources required.
- Finalization and application to the purpose for which it was created.
- Periodic adjustment of the estimate for changes in scope and timing.
- Transformation of estimate values and format into other formats such control estimate.

109- How the code of accounts system must be structured?

- The coding structure must reflect the manner in which the project will be executed, and the way in which the costs can be collected.

110- Which estimating information is used to determine schedule activity durations and resource loading?

Estimate provides labor hours and craft breakdown.

111- What is the goal of the process of integration of estimate and schedule breakdown?

The goal is to determine an appropriate level of detail to correlate cost and schedule, one to one relationship between estimate items and schedule activities is not possible.

112- What is the first estimate review and its main objective?

The first estimate review is the "estimate team review", the main objectives are:

- Check the math.
- Check Basis of Estimate.
- Make sure that estimate adheres to the department guidelines.

113- What is a typical breakdown of a Basis of estimate (BOE) document?

The basis of estimate is subdivided in:

- Design Basis
- Planning Basis
- Cost Basis
- Risk Basis



114- What is design basis?

It is a subdivision of BOE containing:

- Summary of project scope
- Specific inclusions and exclusions of items and facilities.
- Equipment list attached.
- Documents used to develop estimate

115- What is planning basis?

It is a subdivision of BOE containing:

- Integrated project plan that affects estimate.
- Contract strategy
- Length of work week, shift, overtime etc.
- Project schedule and milestones.

116- What is cost basis?

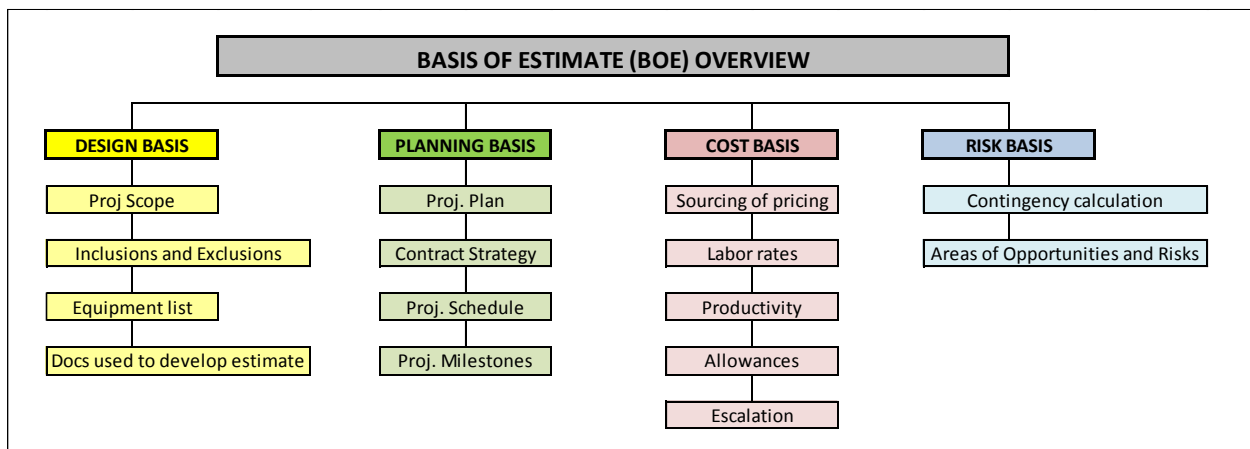
It is a subdivision of BOE containing:

- The source of pricing used.
- Labor rates
- Productivity
- Allowances
- Escalation

117- What is risk basis?

It is a subdivision of BOE containing:

- Description of contingency calculation
- Identification of key areas of risks and opportunities





118- What is the estimating department guidelines review objective?

- To verify that proper estimate methods techniques and procedures have been followed.
- Confirm that estimate summary and details are organized and presented in the proper format.
- Ensure all estimate back up is organized.
- Verify that all allowances and factors are appropriated for the estimate type.

119- What is the engineering/design estimate review objective?

- Make sure that the latest version of the engineering documents have been used on the estimate development.
- Double check the equipment list and equipment pricing for completeness and accuracy.
- Check design basis on BOE.
- Review engineering/design costs.
- Review risk basis.
- Make sure that scope of the project as understood by engineering is reflected on estimate.

120- What is the goal of project manager and project team review?

- Check estimate documentation, BOE, estimate summary.
- Verify that latest project schedule agrees with estimate.
- Examine administrative and home office costs.
- Conduct final construction strategy review.
- Review indirects, Temporary facilities, temporary services, construction equipment, tools and consumables.
- Gain support of the entire team.

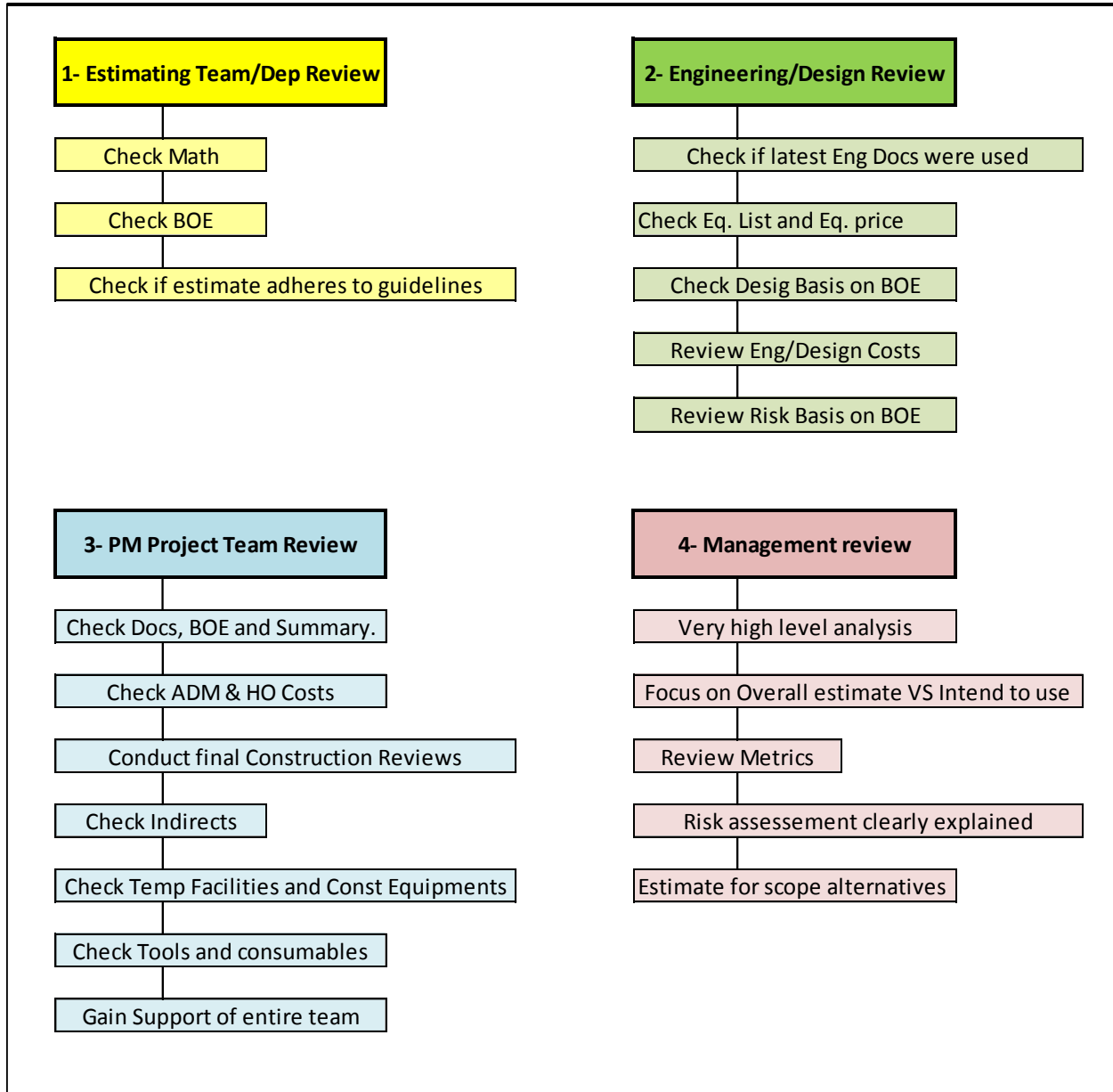
121- What is estimate validation?

Consists in benchmarking key estimate ratios and metrics. Any Large discrepancies should be explainable by the particularities of the project.

122- What is the management review objective?

- This is the last series of review.
- Very high level analysis.
- Focus on overall estimate versus intend to use.
- Review the metrics.
- Cost risk assessment should be clearly explained.
- Estimate for scope alternatives may be required.

ESTIMATE REVIEWS CHART



123- What is Building Information Modeling (BIM)?

It is a digital representation of the physical and functional characteristics of a facility.

124- What the BIM is used for?

It is used for stakeholders to insert, extract, update or modify information in the BIM to support or reflect the roles of that stakeholder.



125- What are the BIM dimensions?

3D – Graphical Modeling

4D- Time modeling 4D=3D+time

5D- Cost modeling 5D=4D+cost

126- What is BIM level of detail?

The descriptions of the steps through which a BIM element can logically progress from the lowest of conceptual approximation to the highest level of representation precision.

127- What are the five Levels of Details (LOD) in a BIM?

- LOD 100 – Conceptual
- LOD 200 – Approximate Geometry
- LOD 300 – Precise Geometry
- LOD 400 – Fabrication
- LOD 500 – As Built
-

128- What is bidding?

It is the process of submitting a formal proposal to enter into an agreement to provide a service, product or project in return for an identified price.

129- What are Liquidated Damages?

Is a monetary compensation for a loss, detriment or injury to a person or property, awarded by a court judgment or by a contract stipulation regarding breach a contract.

130- What is Bid Security?

It is a payment provided in connection with a submittal of a bid to guarantee that the bidder, if awarded the contract will execute the contract and perform the work. The Bid Security is paid to the owner, this amount is retained until the bidder has executed the agreement.

131- What is Bid Shopping?

It is the unethical practice of a prime contractor providing the low price for a scope of work to other subcontractors or suppliers in attempt to get the others to underbid their original quotes.

132- From an owner's perspective, what is the goal of the budget process?

The goal is to develop a budget that reflects all anticipated costs to develop the project.

133- What is the most common estimate class used to develop a budget?

Class 3 estimate.



134- What are the two major components that forms the basis of project controls?

Budget and schedule.

135- What are Lifecycle costs?

The lifecycle costs are not only the costs of the product initial development, but also the costs of operating, maintaining, upgrading and prolonging its functional utility over the life of the improvement, and then the costs of demolition, salvage or disposing.

136- What is the discount rate to be used on lifecycle cost calculation?

It is the asset owner's minimum acceptable rate of return (MARR)

137- What is integrated project delivery?

Is an approach to executing a project in which increased cooperation and communication between all parties involved in a project.

138- Scrap is a direct manufacture cost and is also a variable cost. Material returned due to quality issues is not a manufacture cost.

139- Equipment rental is a direct cost to the project, however, the use of the equipment that is owned by the company would be part of the overhead and is considered an indirect cost.

140- AEC (Architecture, engineering, construction) – CSI(Construction Specification Institute)

141- On Risk Mitigation process we are looking for risks with low costs to mitigate and high probability of success.



Estimate methodologies summary.

ESTIMATE METODOLOGIES				
Methodology	Aplication	Characteristics	Examples	Comments
End-Products Units Method	Conceptual	Relates construction cost with end-product units	Cost of hotel based on number of rooms.	
Physical dimensions Method	Conceptual	Uses the physical dimensions of the item being estimate as the driving factor.	Building estimate based on sqft.	Economies of scale are ignored.
Capacity factor	Conceptual	Cost of a new facility is derived from the cost of similar facility of a known capacity.	$\$B/\$A=(CapB/CapA)^e$	Location, time, and scope differences should be taken in consideration, and number must be adjusted with the info available.
Ratio or factor methods	Conceptual	The cost of a plant or facility can be reliably estimated from the cost of a primary component.	Lang factor and Hand Factor.	
Parametric	Conceptual	Is a mathematical representation of cost relationships that provide a logical and preticable correlation between the physical and funcional characteristics of a plant and the final cost.	Capacity factor method is a example, more complex parametric models typically involve several independent variables or cost drivers.	
Deterministic(detailed)	Bid/Control	Scope definition is quantitatively surveyed and pricedusing the most realist unit prices available.		



I suggest that you study and understand the graphs below, they are from the book Control and Management of Capital Projects, second edition, John W. Hackney. You can buy it in the ACE website store.

