

SR. NO	QUESTION	EXAM
1.	Which aspects of business environment are to be mentioned while identifying new project opportunities? Which areas of Corporate Strength & Weakness are also required to be analyzed?	May 2015, 2013
ANS:	<p>The global environment refers to the MACRO ENVIRONMENT which comprises of:</p> <ul style="list-style-type: none"> - Industries, markets, companies, clients and competitors <p>Consequently, there exist corresponding analyses of the MICRO ENVIRONMENT of a company</p> <ul style="list-style-type: none"> - Suppliers, customers and competitors are analyzed within the industry analysis <p>PESTEL (political, economic, socio-cultural, technological, environmental & legal) factors need to be mentioned while identifying new project opportunities. Also, transport, communication & power distribution systems should be mentioned.</p> <p>CORPORATE STRENGTH AND WEAKNESS are majorly <u>an internal factor</u> to the company. They are:</p> <ul style="list-style-type: none"> - Human resource - Finances - Internal advantage/ disadvantage of the Organization - Physical resources - Experiences including what has and what has not worked for the Org in the past 	
2.	<p>Discuss why a Project Manager called an "Entrepreneur"?</p> <p>"It is said that for a project manager to be successful, he should possess entrepreneurial skills" Discuss</p>	<p>May 2015, 2013</p> <p>May 2007, 2008</p>
ANS:	<p>An entrepreneurial mindset is like an executive mindset for the project manager. He or she would focus on delivering high value to the customer, employees and his or her organization.</p> <p>The personal qualities of a Project Manager required for successful execution of a project are similar to the qualities required of an entrepreneur, who has to strive hard for the success of his business venture. Some of the prominent PERSONAL ABILITIES are listed below:</p> <ol style="list-style-type: none"> 1. Planning Ability: To set targets & milestones for largely dissimilar projects; breakdown of tasks 2. Maturity: To patiently handle vast number of functional specialists, consultants, sub-contractors during complex situations; make moves in interest of the project 3. Toughness: and willingness to take contrary positions rather than easy way out or path of least resistance or giving into pressure 	Page 26-30

	<ol style="list-style-type: none"> 4. Receptive: Open to ideas, ready to take criticism, directions and suggestions from any person involved in the project 5. Communication Skills: Written & Oral 6. Energy: to deal with problems & put in extra hours if required, work across time zones 7. Ability to take measured risk: Unknown problems, Untested solutions, Fair risk in decision making 8. Go getter attitude: Optimistic approach to issues, enthusiasm to make progress, no excuses <p>The project manager should also possess the following MANAGERIAL QUALITIES:</p> <ol style="list-style-type: none"> 1. Good Interpersonal Skills 2. Conflict solving ability 3. Problem solving capabilities 4. Perspective vision 5. Good time manager/ Ability to delegate 6. Familiarity 7. Initiative 	
<p>3.</p>	<p>What is "DPR" (Detailed Project Report)? What points will you include in a DPR?</p> <p>What are the factors considered for Issuing the "Project Progress Report"</p>	<p>May 2015, 2013, 2011, 2010, 2009, 2008, 2007</p>
<p>ANS:</p>	<p>DETAILED PROJECT REPORT is the starting point while approaching financial institutions or lenders for funding the projects.</p> <p>The prominent COMPONENTS of the DPR include:</p> <ol style="list-style-type: none"> 1. <u>General information</u> about the project 2. The <u>project promoters</u> and their past experience in this field or elsewhere. This is required to judge their competence in putting up a project 3. <u>Details of past projects</u> completed by the promoters or working results of businesses owned by promoters 4. <u>Details of the project</u>, which should comprise of: <ul style="list-style-type: none"> - Product Information - Raw Material Source & Details on raw material 	<p>Pg. 45</p>

	<ul style="list-style-type: none"> - Plant Capacity - Manufacturing technology and details on the application of technology in other projects - Management team responsible for execution of the project or the project management consultants (PMC) - Details of land, environmental clearances, buildings, plant and machinery, etc. - Details of utilities like power, water, infrastructure like roads, highway connectivity and sources for these utilities - Periodicity of raw material availability and confirmed availability of raw materials - Effluent treatment arrangements and steps proposed to prevent environment damage - Requirement and availability of labor and facilities for their welfare <p>5. <u>Project Implementation Schedule</u></p> <p>6. <u>Project Financials</u> & calculation of returns. Profitability cash flow estimates</p> <p>7. <u>Means of financing</u> the project</p> <p>8. <u>Requirement of working capital</u> and <u>arrangements made</u> for the same</p> <p>9. Commercial details relating to <u>marketing and distribution arrangements</u></p> <p>10. Mode of <u>term loan repayment</u></p> <p>11. <u>Government approvals</u>, local body consents, and other statutory permission</p> <p>12. <u>Details of collateral security</u> that can be offered to the financial institutions, other than the project</p>	
<p>4.</p>	<p>Explain how uncertainties related to time duration of project activities as well as for the project completion are handled in PERT approach to project planning.</p> <p>What do you understand by 'Three Time Estimates' method for network scheduling and under what circumstances it is used? What is the probability of completing the project within the total scheduled time calculated on the basis of Three Time Estimate Method?</p>	<p>May 2015</p> <p>Nov 2015, May 2009, 2010</p>
<p>ANS:</p>	<ul style="list-style-type: none"> - PERT is a network analysis technique <u>used to estimate project duration when there is a high degree of uncertainty</u> about the individual activity duration estimates. - PERT uses <u>probabilistic time estimates</u>. Duration estimates based on using optimistic, most likely, and pessimistic estimates of activity durations, or a three-point estimate. - PERT attempts to address the risk associated with duration estimates by developing <u>schedules that are more realistic</u>. - It involves <u>more work than CPM</u> since it requires <u>several duration estimates</u>. <p>Estimation of time required for completion of various activities in the project is one of the crucial</p>	

	<p>issues in network scheduling. Normally, estimates are done by project personnel based on data of similar activities in the past. However, in case of some projects, like, research and development projects, for which PERT method is used, there is no past data to base the time estimates. Sometimes, external factors have strong influence on the project and therefore, the time required to complete the project is not precisely known. Time estimation in such cases is done through statistical method called “Three Time Estimates”.</p> <p>Time estimation by this method is essentially a weighted average of three time estimates, viz., Pessimistic time estimate, Optimistic time estimate and Most likely time.</p> <p>(a) Pessimistic Time Estimate T_p– Considering that activity faces maximum possible problems & delays.</p> <p>(b) Optimistic Time Estimate T_o – Considering that activity does not encounter any problems</p> <p>(c) Most Likely Time T_m – Considering the activity faces moderate delays as normally expected.</p> <p>Average time for the activity to be used for network calculation is given by formula: Average time = Pessimistic time + (4 x Most likely time) + Optimistic time $\frac{\quad}{6}$</p> <p>Task Time Variance $S^2 = ((T_m - T_o) / 6)^2$.</p> <p>This is the variation in the actual vs expected time duration.</p> <p><u>The lesser the time variance, the better estimate</u> can be calculated and thus better project planning and cost planning.</p>	
5.	<p>Define a project. What are the characteristics of a project?</p> <p>What are the 5 parameters that define a Project? Briefly discuss any two of the parameters.</p> <p>What are the pre-requisites of successful project implementation</p>	<p>May 2015</p> <p>May 2014, 2013</p> <p>May 2015</p>
ANS:	<p>Project Management Institute: A Project is a temporary endeavor undertaken to create a unique product or service</p> <p>EXAMPLES OF PROJECTS include, but are not limited to:</p>	

- Developing a new product or service,
- Affecting a change in the structure, staffing, or style of an organization,
- Developing or acquiring a new or modified information system,
- Constructing a building or infrastructure, or
- Implementing a new business process or procedure.

CHARACTERISTICS OF A PROJECT:

CHANGE

- Projects are a way to introduce change.
- Example: A new sales website will change how clients purchase items.

TEMPORARY

- There is always a specific start and end to a project, and it should cease once the mandatory products are created.
- Ongoing maintenance of a product occurs after the project and is not considered part of the project.
- Example: The production of a software to manage sales.

CROSS- FUNCTIONAL

- A project engages people from different seniority and business departments that work together for the period of the project.
- Example: To develop sales software, people from marketing and sales departments should work closely with the IT department.

UNIQUE

- Every project is unique.
- Example: Building a fiftieth school is different from building the forty-ninth one. The location is different, the design is different, and there are different categories of students.

UNCERTAINTY

- Parts of the project are unique, which brings uncertainty. The project manager is not 100% sure

how this is going to work out.

- Example: The owners might keep changing their minds about the components and functionalities of the sales software.

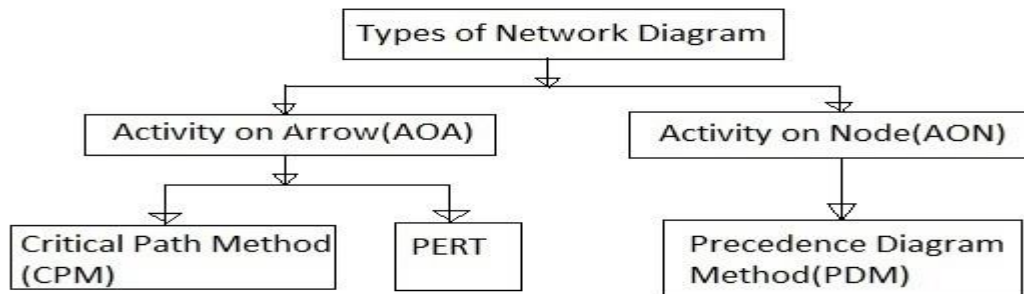
6. Discuss the 4 types of Lead/Lag relationships in Arrow on Node (AON) Networks. Draw relevant block diagrams

May 2015

Difference between AOA & AON

May 2007, 2006

ANS:



AOA	AON
Every activity must have one start & one end.	Can have more than one start & more than one end
Dummy activities required	Dummy Activities not required
Crossing of activity connectors NOT allowed	Crossing of activity connectors allowed
AOA more popular due to early development.	AON active only over 7-8 yrs hence, less popular
AOA forms the basis of PERT	All probabilistic projects cannot be shown with AON. Reason: AOA represents activity at nodes. PERT requires events at nodes
Can be used even in applications where there are different time estimates & standard deviations	ONLY used in deterministic projects
Crossing & Resource scheduling easy	Cubersome!
Less Space for Info	Space to write LOT of info

<p>7.</p>	<p>Define Risk and indicate the names of various techniques of Stand-Alone Risk?</p> <p>Define Risk and indicate various types of risks associated with a project. SN: Types of Project Risks</p> <p>Indicate the names of the following:</p> <p>i) Important sources of Risk in a Project</p> <p>ii) Important techniques in 'Analysis of Stand Alone Risk'</p>	<p>May 2015, 2014, 2013</p> <p>May 2013, 2007, 2006</p> <p>May 2014, 2013</p>
<p>ANS:</p>	<p>RISK is the potential of gaining or losing something of value. Risk can also be defined as an intentional interaction with uncertainty.</p> <p>STANDALONE RISK is the risk associated with a single operating unit of a company or asset. Standalone involves the risks created by a specific division or project, which would not exist if operations in that area were to cease.</p> <p>i) <u>SOURCES OF RISK:</u></p> <p>Below are few sources of risk that can be available in your project as well. They are:</p> <p><u>Schedule:</u> Whether you will get the hardware or software on time as planned.</p> <p><u>Scope:</u> It is always a risk; whether you have covered all the works required and only the work required. It will cost you hugely in case you have missed any important requirement.</p> <p><u>Resource:</u> This is also unpredictable really; you can't expect availability of the resources as planned. The planned resources can be used for some other projects as well, in that case you need to get someone new and it can create a problem in schedule and cost both. Sometimes in quality also in case of inexperience.</p> <p><u>Quality:</u> The deliverable can be of poor quality due to some other imposed factors, that is a huge risk.</p> <p><u>Cost:</u> Estimation of cost can be a risk in your project; if something you have planned to purchase and if you are not getting the same in time, it can prove costly, as you have to wait for this particular item for a longer period.</p> <p>Apart from above, sources of risk can be organized into categories such as <u>customer risk, technical (product) risk, and delivery risk.</u> Within each category, specific sources of risk can be identified and</p>	

risk reduction techniques applied. Let me explain you these point by point to you:

Material and equipment risks:

- Required hardware will not be delivered on time.
- Access to the development environment will be restricted.
- Equipment will fail.

Customer risks:

Customer risk is related to the customer's key success factors for the project. A project is not successful if the customer is not successful with the process. It can be sub-divided as follows:

- Customer resources will not be made available as required.
- Customer staff will not reach decisions in a timely manner.
- Deliverables will not be reviewed according to the schedule.
- Knowledgeable customer staff will be replaced with those less qualified.
- Conflict within the customer organization about the desirability or feasibility of the project will threaten it.

Scope risks:

- A lack of clarity in the scope definition will result in numerous scope creep.
- A lack of clarity in the scope definition will result in conflict in the customer about the scope.
- A lack of clearly defined acceptance criteria will cause delays in acceptance and sign-off.

Technological risks:

Technical risk arises from the capability of the technical solution to support the requirements of the customer. Again, it can be categorized as follows as well:

- The technology will have technical or performance limitations that endanger the project.
- Technology components will not be easily integrated.

The technology is unproved and will fail to meet customer and project requirements.

- The technology is new and poorly understood by the project team and will introduce delays.

Delivery Risks:

Delivery risk is related to the ability of the complete team to deliver against the plan at the cost and

schedules estimated, like;

- System response time will not be adequate.
- System capacity requirements will exceed available capacity.
- The system will fail to meet functional requirements.

Unpredictable risks:

- The office will be damaged by fire, flood, or other methods.
- A computer virus will infect the development environment or operational system.

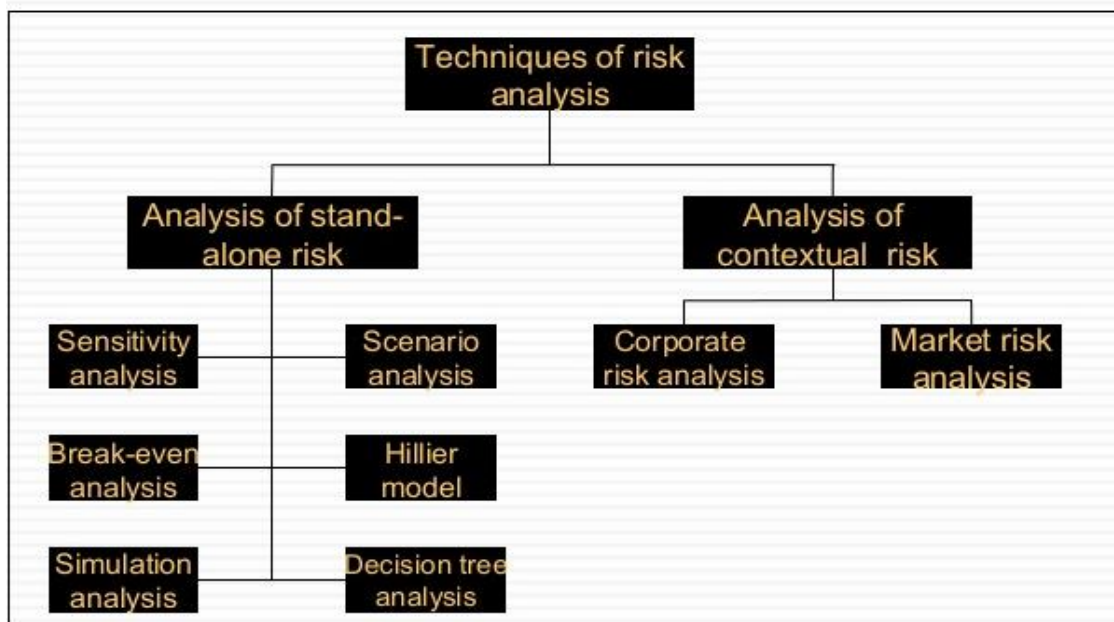
Project management risks:

- The inexperience of the project manager will result in budget or schedule slippages.
- Management will deem this project to have a lower priority for resources and attention.

Resource risks:

- Main staff may not be available.
- Key skill sets will not be available when needed.
- Key staff will be lost during the project.
- Subcontractors or vendors will below-perform and fail to meet the milestones.

TECHNIQUES FOR RISK ANALYSIS



8.	How do the resource constraints affect the project schedules? Discuss various problems encountered in resource allocation to activities under a situation of multiple resource requirement with limited availability and what the different alternatives to allocate resources without affecting the final completion data?	Nov 2015, May 2010, 2009
ANS:	<p>RESOURCE CONSTRAINTS:</p> <ul style="list-style-type: none">- Constraints are anything that either <u>restricts the actions of the project team or dictates the actions of the project team.</u>- Constraints <u>put you in a box.</u>- As a project manager, you have to manage to the project constraints, which sometimes <u>requires creativity.</u> <p>THE CONSTRAINTS!</p> <p>"BUDGET" is always going to be one of the key project constraints...no question. Budgets limit the project team's <u>ability to obtain resources</u> and might potentially <u>limit the scope</u> of the project.</p> <p>Example: component X cannot be part of this project because the budget doesn't support it. The customer usually has only so much they can spend on the project. Likewise, work can only be done by the delivery organization for a certain price...it can only be done so cheap. At some point it wouldn't worth doing.</p> <p>"TIME" is another key project constraint. This usually comes in the form of an <u>enforced deadline</u>, commonly known as the <u>"make it happen now"</u> scenario.</p> <p>Example: If you are in charge of the company's project manager retreat scheduled for June 15th, your project is time constrained. Once the <u>airline and hotel reservations have been made</u> and work has been set aside, you can't move the date. You can't just go into your project scheduling software and move the tasks further out. It just doesn't work that way. It's <u>set in stone</u> now – all activities on this project are <u>driven by the due date</u> and the projects that your project managers are running rely on this date to be met.</p> <p>"QUALITY" would typically be restricted by the specifications of the product or service. Most of the time, if quality is a constraint, one of the other constraints – time or budget – has to have some give. <u>You can't produce high quality on a restricted budget and within a tightly restricted time schedule.</u> Of course, there are exceptions, but usually not in reality – just in the movies.</p>	

“SCHEDULE CONSTRAINTS” can cause interesting dilemmas for the project manager.

Example: Let’s assume you are the project manager in charge of rolling out a new customer relationship management system (CRM). If end users aren’t available to help with requirements definition and then later to perform user acceptance testing, then you won’t be able to meet your schedule deadlines. So resource availability is definitely a constraint.

“TECHNOLOGY” can also be a major project constraint.

Example: Your project might require the use of leading-edge technology that is still so new it’s not been released on a wide-scale basis. One impact might be that the project will take an additional six months because existing technologies need to be used instead of the new technology. What’s happening in your organization and with your executive management can also be a project constraint. They can change direction, change priorities, and change funding depending on what they think is best for the organization at any given time...and it can impact your project or projects.

PROBLEMS ENCOUNTERED:

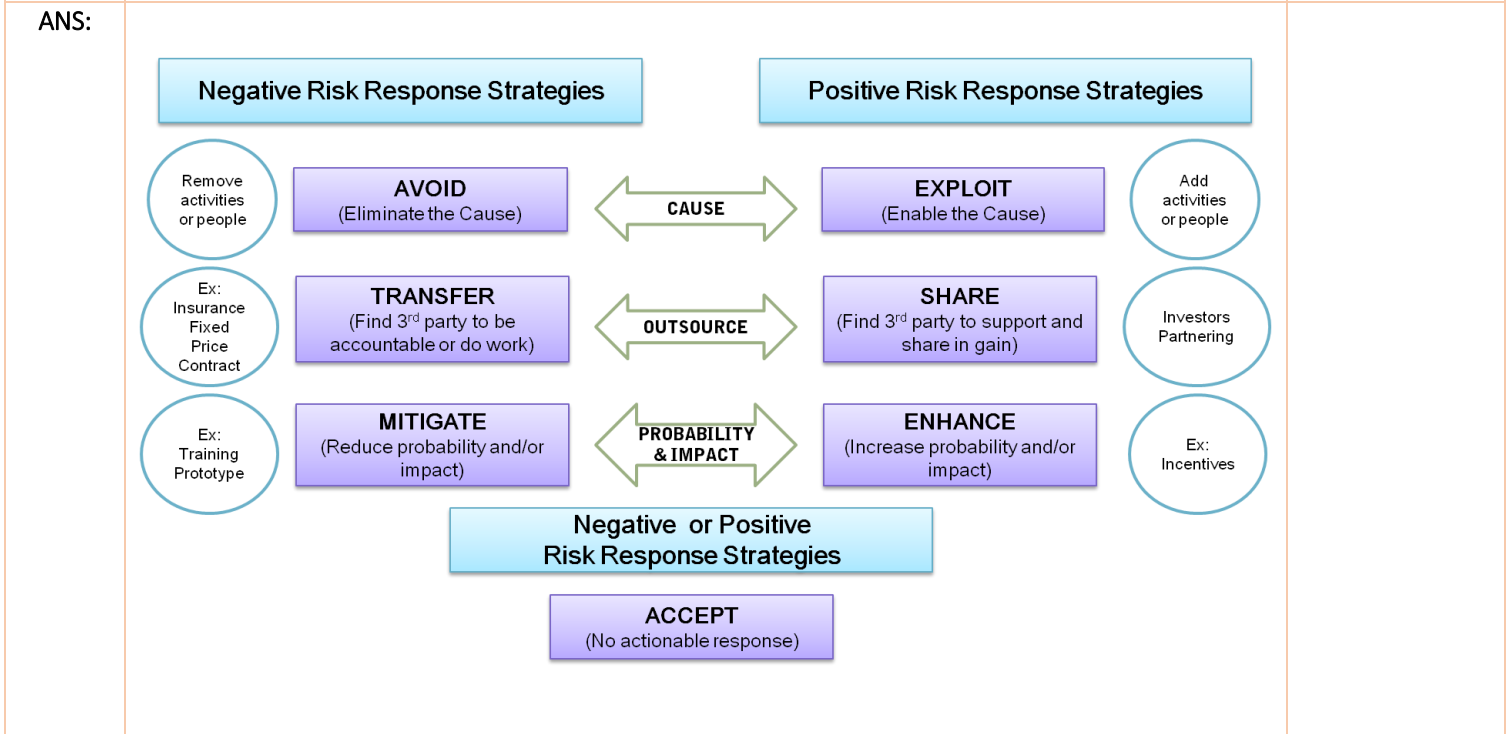
- **Some** of the resources may be available but others **may not be available during a particular period.**
- **Some** of the resources may be available at a required level, however, other resources may **not be available at the required level.**
- **All** the resources **may be available but not at the required level.**

ALTERNATIVES TO ALLOCATE RESOURCES without affecting final completion date are:

- ✓ **Resource limited scheduling** in which the schedule is prepared considering the availability times of certain resources without affecting end date.
- ✓ **Resource Levelling** [Technique]. Any form of schedule network analysis in which scheduling decisions (start and finish dates) are driven by resource constraints (e.g., limited resource availability or difficult-to-manage changes in resource availability levels).
- ✓ **Resource Smoothing** [Technique]. Any form of schedule network analysis in which scheduling decisions (start and finish dates) are driven by smoothing resource levels to the resource constraints.

- ✓ Applying available resources for higher number of hours (over-time) with an increase in cost (crashing).
- ✓ Non-Critical activities are given second priority for resources application as compared to critical activities.
- ✓ Inexperienced personnel can be put on activities with float or slack.

9. What are the "Risks Response Strategy" normally followed to manage the risks. Explain the methods of 'transferring the risk' to another party? May 2013



RISK HANDLING METHODS

Risk avoidance

- Avoid property, person or activity which produces risk

Loss control

- Is aimed to reduce TOTAL AMOUNT of loss
- It is influenced by FREQUENCY of loss and SEVERITY of loss
- FREQUENCY : the number of times a loss producing event occur over a given period of time
- SEVERITY : the cost or amount of loss
- It handles risk through LOSS PREVENTION and LOSS MINIMISATION

Risk retention

- Retaining of risks by an individual or organization
- Losses incurred are borne by the party retaining the risk
- It may be planned or unplanned

Risk transfer

- Transferring of risk to another party, individual or organization
- Losses will be paid by the party to whom the risk is transferred
- Risks transferred through INSURANCE CONTRACT and NON-INSURANCE CONTRACT

10. What are the main aspects/factors to be considered in the "Technical Analysis" of a Project?

May 2015, 2013,
2012

ANS: TECHNICAL APPRAISAL / ANALYSIS

Comes under the domain of technical or engineering experts. Basically involves technical appraisal of given project.

BASIC PARAMETERS

- (1) Plant capacity
- (2) Product Mix
- (3) Manufacturing Process / Technology
- (4) Technical arrangements
- (5) Materials and inputs
- (6) Location and site.
- (7) Environmental aspects
- (8) Civil works and structures
- (9) Machinery and Equipment
- (10) Plant layout & project charts
- (11) Project implementation schedule

(12) Considering alternatives.

A. PLANT CAPACITY

Plant capacity has to be decided only after careful consideration of following aspects:

- Economies of scale / Technology requirement (Aluminum smelter or cement plant)
- Input constraints
- Investment costs: $C_1 = C_2 (Q_1/Q_2)^\alpha$
- Market Potential
- Resources at the disposal of the firm
- Government Policy

B. PRODUCT MIX

- Is guided by market forces
- Should be aimed at maximizing the profits e.g. soap manufacturing.
- Production facilities should be planned to allow flexibility in product mix to adjust to changing market conditions. Appropriate trade off between additional investment and flexibility in product mix is necessary.

C. MANUFACTURING PROCESS / TECHNOLOGY

For many products, two or three alternative processes are available:

- DMT versus PTA route for the manufacture of polyester or PET is a well known controversy.
- Steel: Blast furnace, Electric Arc Furnace Route
- Dry process versus wet process for portland cement manufacturing.
- Solvent extraction plants could use batch process or continuous process, Refining could be mechanical refining or chemical refining.
- Bio-diesel could be produced from vegetable edible or non-edible oils

CHOICE OF TECHNOLOGY

Choice of technology is governed by:

- Plant capacity (at least 300 TPD for cement plant using rotary kiln; otherwise vertical shaft technology)
- Major inputs
- Project cost and cost of production

- Successful use by other units
- Product mix including byproducts
- Latest developments
- Easy adaptability
- Eco-friendly?
- Appropriate Technology for local conditions

D. TECHNICAL ARRANGEMENTS

- Appropriate arrangements for technical know how for the manufacturing process are pre-requisites for a successful operation.
- Technical collaboration, if necessary, should consider:
- Project and process designing, technical inputs, selection of equipment, installation, commissioning, maintenance contract, training of personnel, etc.
- Period of collaboration,
- Terms and conditions of collaboration viz. lumpsum payment, licensing fee and / or royalty,
- **Technical collaboration, if necessary, should consider:**
 - ✓ Process and performance guarantees wrt capacity, process parameters, consumption of raw materials, utilities, etc. – penalty clauses
 - ✓ A clause for continuous updating of know-how, benefits of R & D work, Use of brand names, export assistance or restrictions if any,
 - ✓ Participation in equity,
 - ✓ Assignment of responsibilities in case of change of ownership,
 - ✓ Termination of agreement and dispute mechanism,
 - ✓ Clauses applicable in case of force majeure

E. MATERIALS AND INPUTS

Advance and meticulous planning is required for procurement of right quality / specifications & quantities of:

- Raw materials (Agricultural, Marine, Mineral, Livestock, Forest Products, etc.)
- Utilities
- Processed industrial materials, components,
- Auxiliary materials / consumables and factory supplies, etc.

F. LOCATION AND SITE

- Proximity to suppliers of raw materials and markets
- Proximity to ancillary units
- Availability of Infrastructure
- Labor situation
- Government policies and incentives
- Other factors

G. CIVIL WORKS AND STRUCTURES

- Site preparation and development (grading & leveling, roads, fencing / boundary walls, connections for utilities, pipelines, cabling, drainage, etc. within battery limits.)
- Buildings and Structures (Administrative, Factory & Auxiliary buildings like storage, warehouses, Residential, Canteen, Medical, Prayer rooms, etc.)
- Work outside the battery limits of the plant: supply and distribution of utilities, effluent disposal, transportation arrangements, etc.

H. PLANT AND MACHINERY & EQUIPMENT

- Choice depends on the technology used and the designed capacity of the plant.
- Capacities of different sections should match (Detailed calculations are required to decide on configurations of machinery / process equipment, estimate of likely levels of production, type of machine operations, production hours required for each operation and hence machine, number of machines required and provision for emergencies, etc.).
- Equipment could be of different types: Process, mechanical, electrical, instrumentation & process control equipment, internal transportation (cranes, lift trucks, etc.)
- List of maintenance equipment, quality control laboratory, spare parts and tools required.
 - ✓ Constraints on selection of plant and machinery (availability of power, large size equipment and hence difficulty in transportation, shortage of skilled labor, etc.)
 - ✓ Coordination for procurement of plant and machinery: Different items from different suppliers, Turn-key project v/s in-house responsibility of packaged contracts,
 - ✓ Factors to be considered while making a choice of supplier/s (reputation, quality, delivery schedules, terms of payment, Performance Guarantees (mechanical, input and output), and

	<p style="text-align: center;">rewards or penalties related to period of completion.</p> <p>I. PLANT LAYOUT AND PROJECT CHARTS</p> <ul style="list-style-type: none"> • Functional Layout • Plant Layout (smooth flow of raw materials, proper utilization of space, provision for expansion, safety of personnel, minimizing movements and hence production costs) • Flow process chart and Material Flow Diagram (ideally, balance of material at every stage should also be mentioned). • Production Line Diagram • Utility Line Diagrams and Consumption Layout, • Transport Layout • Communication Layout • Organization Chart 	
<p>11.</p>	<p>What is "Matrix Organization"? Why this form of organization is best suited for implementing a Project?</p> <p>What is the best suited organization for implementing a project?</p>	<p>May 2015, 2014, 2010, 2008, 2007</p>
<p>ANS:</p>	<p>The Matrix Organization is an attempt to combine the advantages of the pure functional structure and the product organizational structure. This form is ideally suited for companies such as construction companies that are "Project driven".</p> <ul style="list-style-type: none"> - Information sharing is mandatory in such an organization & several people may be required for the same piece of work. - The total responsibility & accountability of the project, however lies with the Project Manager. - The functional departments on the other hand, have functional responsibility to maintain technical assistance on the project. - Each functional unit is headed by a department manager whose responsibility is to ensure that a unified technical base is maintained and that all available information can be exchanged for each project - Shared responsibility between project and functional management <p>ADVANTAGES OF MATRIX ORGANIZATIONS:</p> <ol style="list-style-type: none"> 1. The project cost is minimized because the key people can be shared. Shared cost is much less compared to one complete individual 2. Conflicts are minimal and those requiring hierarchical referrals are more easily resolved 	<p>Pg. 40</p>

- 3. There is a better balance between time, cost and performance
- 4. Authority & Responsibility are shared
- 5. Stress of timely delivery is distributed amongst team members

12. Indicate the names of various Techniques used in Qualitative & Quantitative models of Demand Forecasting May 2014

ANS:

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GENERATION OF PROJECT IDEAS & FORECASTING OF DEMAND Pg ①

METHODS IN FORECASTING

Qualitative

- ① Survey Using Questionnaire
- ② Sales Force Composite
- ③ Expert Opinion
- ④ Delphi Tech.
- ⑤ Past Sales Analogy

Quantitative

Time Series

- Simple Moving Average
- Weighted Moving Average
- Simple exponential Smoothing method
- Double exponential Smoothing Method

CAUSAL METHODS

- Simple Regression Analysis
- Multiple Regression Analysis

→ RSFE = $\sum_{t=1}^n (A_t - F_t)$

→ MFE = $\frac{1}{n} \sum_{t=1}^n (A_t - F_t)$

→ MAD = $\frac{1}{n} \sum_{t=1}^n |A_t - F_t|$

→ MSE = $\frac{1}{n} \sum_{t=1}^n (A_t - F_t)^2$

→ RMSE = \sqrt{MSE}

→ MAPE = $\frac{100}{n} \sum_{t=1}^n \left| \frac{A_t - F_t}{A_t} \right|$

* Least Error should be preferred *

Forecasting Pg ②

① Simple Moving Avg.

$F_{15} = (A_{14} + A_{13} + A_{12}) / 3$ ← 3 yr moving avg to forecast 15th year

$F_{15} = (A_{14} + A_{13}) / 2$ ← 2 yr moving avg. to forecast 15th year

Yr.	Sales (A _t)	Forecast (F _t)	A _t - F _t	A _t - F _t	(A _t - F _t) ²	$\frac{ A_t - F_t }{A_t}$
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Tracking Signal = $\frac{RSFE}{MAD}$ P.T.O

⊛ Forecast is in control if Tracking signal is ±2 to ±5

⊛ Good forecasting method has tracking signal near 0

Forecasting: Pg ③

② Weighted Moving Average

$F_{15} = A_{14} \times W_1 + A_{13} \times W_2 + A_{12} \times W_3 + A_{11} \times W_4$

where F_{15} = Forecast for 15th year
 A = Actual Demand
 w_1, w_2, w_3, w_4 = weights for the 4 periods starting from most recent

③ Simple Exponential Smoothing

$F_{t+1} = \alpha A_t^{\text{actual}} + (1-\alpha) F_t^{\text{initial forecast}}$

④ Simple Regression Analysis

- Not a time series variable
- Dependent Variables
- If time series involved, called "fitting a trend line"

$y = a + bx$ {y is dependent, x is independent}

$b = \frac{\sum xy - n \bar{x} \bar{y}}{\sum x^2 - n \bar{x}^2}$ & $a = \bar{y} - b \bar{x}$

X	Y	XY	X ²

<p>13.</p>	<p>What is Project Appraisal? Indicate the names of all the main areas to be covered in a typical Project Appraisal Note.</p> <p>Explain the different components of Project Appraisal. What is the relevance of each, for project viability?</p> <p>What is Project Appraisal? Explain the various Appraisal criteria used before execution of a project</p>	<p>May 2014</p> <p>May 2012, 2011</p> <p>May 2011, 2009, 2008</p>
<p>ANS:</p>	<p>Project appraisal is an <u>appraisal of project objective, project design, project finance, economic, technical and commercial feasibility and projects cost, benefit and profit.</u></p> <p>Project appraisal is the process of assessing, in a structured way, the case for proceeding with a project or proposal, or the project's viability.</p> <p>PROCESS</p> <ul style="list-style-type: none"> · Initial Assessment · Define problem and long-list · Consult and short-list · Evaluate alternatives · Compare and select Project appraisal <p>Project appraisal is an appraisal of project objective, project design, project finance, Economic, Technical and Commercial feasibility and project’s cost, benefit and profit. It is a complete and systematic review of all aspects of a project. It is a second look at the project feasibility report by a person other than one who is associated with its concepts and preparations.</p> <p>1. Market Analysis – Assessing as to what would be aggregate demand of proposed product/services in the future? What would be the market share of the product under appraisal?</p> <ul style="list-style-type: none"> ◆ Market survey / Field Survey ◆ Characterization of the market ◆ Forecasting Demand & Supply and assessing the gap 	

◆ Preparing a complete market plan

2. Technical Analysis – A very wide gamut is covered in this analysis

- (a) Preliminary tests – like prototype, (b) Production processes and equipment
- (c) Availability of raw material, labour, power and other inputs
- (d) Waste management – Toxic effluents management, etc.
- (e) Location selection, (f) Social acceptance

3. Financial Analysis

- (a) Cost of project / Investment Outlay (progressive requirement of funds)
- (b) Means of financing (c) Cost of capital, (d) Cash flows assessment
- (e) Break-even point assessment, (f) Profitability assessment
- (g) Risk assessment, (h) Investment worthiness, (i) Projected balance sheets.

4. Economic Analysis – It is judging the project from social point of view, the analysis of social costs and benefits, like, jobs it will generate, effect on pollution, convenience of masses, environmental effects, etc. Some of the special questions that are analysed are –

- (a) What is the social cost-benefit equation in terms of shadow pricing and not market prices
- (b) How will it affect the market price of the product? Will it make the product more affordable? Additional capacities may bring down the prices in the market.
- (c) Will it affect any other segment of industries? Many small scale industries are adversely affected by the larger projects due to economies of scale enjoyed by bigger projects.
- (d) Will it trigger further investments? Bigger projects kick start lot of supporting economic activities in the vicinity, starting from the tea vendors and hutment grocery stores to schools and so on.

5. Ecological Analysis

- a) What are the likely damages caused by the project to the environment?
- b) What is the cost of minimizing the damages to bring them down to acceptable limits?

6. Managerial Appraisal – Good execution can make a bad idea profitable but an excellent idea cannot survive bad implementation. Success of any project eventually rests in the hand of the

	<p>managers of that project. Managerial capability of promoters is judged by their resourcefulness, their understanding of the project details and their commitment to the project.</p> <p>7. Environmental Analysis</p> <p>The growing concern of environment, resource depletion and pollution have forced the planners, policy makers to take care of impacts of the project on environment :</p> <p>The appraisal therefore evaluates project impact on :</p> <ol style="list-style-type: none"> (1) Air (2) Water (3) Monumental resources (4) Land (5) Sound (6) Human inhabitation nearby (7) Animals and Birds <p>The appraisal often relies upon environmental impact assessment (EIA) conducted by independent body Such studies are conducted to reveal whether there is any impact of project in a long run on environment If it is revealed that there will be no harmful change in various social economic and physical attributes of environment of the project then the project will be considered favorably.</p>	
14.	<p>What is the 'Incremental Principle' for measurement of Cash Flows for a Project? What are the main guidelines to be followed while using the 'Incremental Principle'?</p> <p>Explain the rationale behind considering "Cash Flows" instead of profit as a measure to be used for investment appraisal. What are the adjustments to be made to profit after Tax figures to calculate operating cash flows?</p>	<p>May 2014</p> <p>May 2013, 2012</p>
ANS:		
15.	<p>While comparing two projects using DCF techniques, what are the situations under which NPV & IRR criteria give conflicting conclusions? How do you select the project under such situation?</p> <p>What are the main differences between Net Present Value (NPV) and Internal Rate of Return (IRR)?</p>	<p>May 2014</p> <p>May 2010, 2007</p>
ANS:	NPV is the Net Present Value. It is the summation of present values of future cash flows less the	

present value of cash outflow. This method takes into account the time value of money. Generally present value of cash outflow is determined by multiplying with the discounting factor which is the cost of capital of the company.

IRR is the Internal rate of return . It is the rate at which the PV of Inflow is equal to the PV of outflow. If IRR is positive then we can go with the project else ditch it.

For capital budgeting decisions a mix of techniques is used. No single method is accurate enough.

Key differences between the most popular methods, the NPV (Net Present Value) Method and IRR (Internal Rate of Return) Method, include:

- NPV is calculated in terms of currency while IRR is expressed in terms of the percentage return a firm expects the capital project to return;
- Academic evidence suggests that the NPV Method is preferred over other methods since it calculates additional wealth and the IRR Method does not;
- The IRR Method cannot be used to evaluate projects where there are changing cash flows (e.g., an initial outflow followed by in-flows and a later out-flow, such as may be required in the case of land reclamation by a mining firm);
- However, the IRR Method does have one significant advantage -- managers tend to better understand the concept of returns stated in percentages and find it easy to compare to the required cost of capital; and, finally,
- While both the NPV Method and the IRR Method are both DCF models and can even reach similar conclusions about a single project, the use of the IRR Method can lead to the belief that a smaller project with a shorter life and earlier cash inflows, is preferable to a larger project that will generate more cash.

Limitations of NPV

- It is difficult to calculate as well as understand as compared to accounting rate of return method or payback period method.
- Calculation of the desired rates of return presents serious problems. Generally cost of capital is the basis of determining the desired rate. The calculation of cost of capital is itself complicated. Moreover, desired rates of return will vary from year to year.
- This method is an absolute measure. When two projects are being considered, this method will

	<p>favour the project which has higher NPV.</p> <ul style="list-style-type: none"> • This method may not give satisfactory results when two projects having different effective lives are being compared. Normally, the project with shorter economic life is preferred, if other things are equal. • This method emphasizes the comparison of net present value and disregards the initial investment involved. Thus, this method may not give dependable results. <p><u>Limitation of IRR</u></p> <ul style="list-style-type: none"> • It does not use the concept of desired rate of return whereas it provides the rate of return which is indicative of the profitability of investment proposal. • It involves tedious calculations, based on trial and error method. • It produces multiple rates which can be confusing. • Projects selected based on higher IRR may not be profitable. • Unless the life of the project can be accurately estimated, assessment of cash flows cannot be correctly made. • Single discount rate ignores the varying future interest rates. 	
<p>16.</p>	<p>Define Project Management. Indicate the names of 5 phases of Project Management. What are the main processes in Project Scope Formulation Phase?</p> <p>What is Project Management & its scope</p>	<p>May 2014, 2013, 2011</p> <p>May 2010</p>
<p>ANS:</p>	<p>Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through the appropriate application and integration of the forty-two logically grouped project management processes comprising the five process groups. These five process groups are:</p>	



PROCESS IN PROJECT SCOPE FORMULATION PHASE:

1/ Project objectives	Overall goal → what, when, how much
2/ Deliverables	Major expected outputs
3/ Milestones	Natural and significant events → time, cost, resources
4/ Technical requirements	To assure performance
5/ Limits and exclusion	Avoid false expectations
6/ Reviews with costumers	Understanding and agreement of expectations

17. [What are the key elements of Project Management?](#) May 2013, 2011
- [Write a short note on 'Computerized Project Management'](#) May 2014, 2006

ANS: Some of these elements might be obvious to you but recognizing these points and addressing them are part of the project management process:

GOVERNANCE – Structure, process, and model where a set of metrics are used to ensure projects selected are aligned with the organization/business objectives. The project governance includes:

- Establishing the metrics - this can be in the form of objectives or goals the department/organization needs to meet including the approval and measurement process. Define roles (stakeholders, leadership, and customers), policies, standards and any associated process.
- Define – define the scope, budget, value, benefit, and timeline.
- Evaluation – process where proposed projects are assessed and selected on basis for best investment of funds, resource, meeting business objectives, and are within the organization capacity to deliver.
- Measure – overall project status in the area of benefits, value, outcomes/output -actual vs plan

Alignment – Projects address the business objectives or goals defined by stakeholders or senior management.

Management – accountability process to ensure the project is progressing according to plan and communicate the project status to stakeholders/customers

Scheduling – project management tools are used to design a detailed project plan of a project from initiation to closing. Tasks in the project plan can be based on a specific order, priority, resource availability, milestones, and/or budget.

§ Define - define your project elements (tasks, resources, budget, duration, milestones, dependencies, etc)

§ What tasks need to be completed?

§ What are the tasks duration?

§ What resource will work on the task (take in to account their availability)?

§ Any risks that could interfere with the task/resource schedule?

§ Identify project dependencies and plan accordingly.

§ Application/Tool – Use a project management tool to assist you in creating your plan.

§ Plan - create your project plan with a small degree of flexibility (given rule is usually around 20%)

§ Review – go back to your project plan and make sure that you are on schedule

Architecture – design the overall solution of the project – this can be done in two approaches: break down your project into to small modules that are cohesive and as much as possible independent from each other or the the project is one big module on its own.

Integration – ensure modules fit together to produce the final product.

Verify and Validate – review and assess the project is in accordance to specification and meets the business goals/objectives

§ Verify - an act to make sure something does as it was intended to do (defined)

§ Validate – an act to make sure something is ‘right’ or not. This ‘right’ is subjective to the user’s need and desire.

Finance – track all costs and make sure the project is within pre-defined budget

Post Mortem Analysis - ‘Lessons Learned’ exercise where team members sit down and review the project’s process from initialization to closing and address key issues of concern.

COMPUTERIZED PROJECT MANAGEMENT:

- Computerized Project Management is a means of easily maintaining Project records and communications in a digital format.
- Computerized project management systems allow for the maintenance of all project documentation in one easily accessed section, with no file cabinets, no big plan files, and with no stacks of paper on the dash of a pickup or thrown in a bottom desk drawer.
- It can provide the type of organization that will combat many of the causes of dysfunctional Operations that are encountered when executing construction work.
- Employing a properly implemented and well-conducted computerized project management system can enhance a company’s efforts in much the same way that electronic financial and payroll systems can provide added administrative value.
- Capable of saving time and reducing the effort required to perform many tasks.

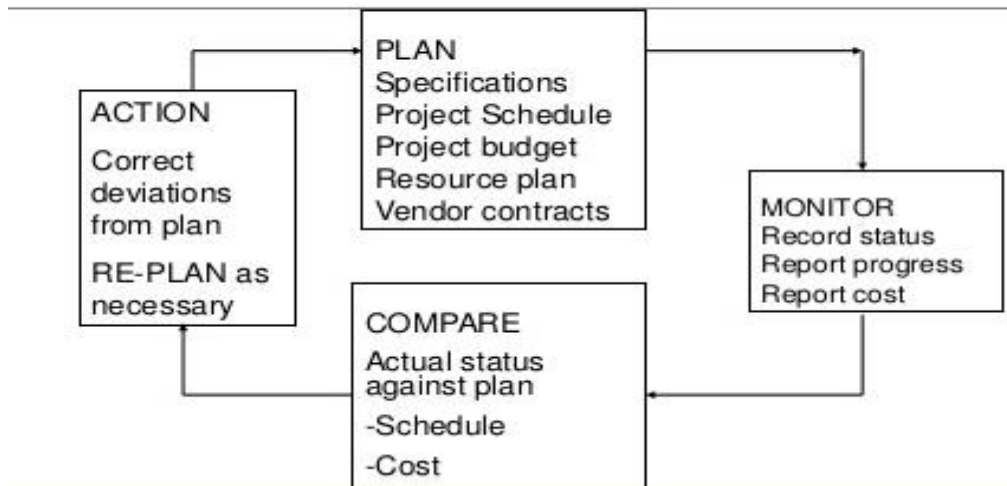
	<ul style="list-style-type: none"> - Can provide better and <u>more accurate, more accessible records</u>; and, they can also both <u>save money by improving efficiency and by making many administrative tasks easier</u> and less time consuming to perform. - Computerized Project records can be <u>accessible from any location</u> - Computerized project management systems can provide an electronic <u>record of an entire project</u>, from Invitation to Bid, or Request for Proposal, through Construction, to Project Closeout, incorporating all of the correspondence and documentation generated along the way. - The original Plans, Specifications and other Contract Documents can be recorded in the system and <u>referenced at any time</u> from any computer or Smart Phone. - A single Drawing, or a full set of Drawings, may be <u>printed upon request at any time</u>. The same ease of access and portability applies to all of the other Contract Documents stored in the system. - They <u>automatically link to one another and to additional supporting documents</u> (scanned and uploaded to the system) so that a complete picture of all of the issues and actions that interrelate to the particular subject of any given form are shown and are readily available. - Emails or attachments received in that manner can be <u>uploaded to the digital Record almost as soon as they are received</u>. - Paper documents that are generated independently outside of the computerized management system (such as concrete batching plant records, testing service or inspectors records and certificates, sketches, letters, general correspondence, receipts, etc.) <u>can be scanned and electronically archived</u> 	
18.	<p>Explain the terms 'Cost Performance Index' & 'Schedule Performance Index' in relation to Earned Value Analysis and how the project performance is interpreted on the basis on these indices? Illustrate your answer with a suitable example</p>	May 2014, 2008, 2005
ANS:		
19.	<p>Explain how "S" curves and concept of "Earned Value" are useful to the top management in assessment monitoring and control of project schedules and costs.</p> <p>SN: Earned Value Management</p>	<p>May 2013, 2011, 2010, 2009</p> <p>May 2011</p>
ANS:		
20.	<p>Differentiate between "Project Monitoring" and "Project Control". Explain Project Monitoring and Control Cycle</p>	May 2012, 2011, 2009, 2008

ANS:

Monitoring and control cycle



PROJECT CONTROL CYCLE



21.	<p>What are the various ways of financing a project?</p> <p>What are the various ways of financing a project along with relative merits and demerits of each of them?</p>	<p>May 2013, 2012</p> <p>May 2012, 2011, 2010, 2009, 2006</p>
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	Short Note: Venture Capital Financing	May 2015, 2014, 2012, 2009, 2008, 2007, 2006
ANS:		
22.	Discuss the key issues considered by financial institutions while appraising a project for term financing	May 2012
ANS		
23.	Explain the various methods that financial institution uses to calculate cost of capital	May 2011
ANS:	<p>The cost of capital is a central concept in financial management. It is used for evaluating investment projects, for determining the capital structure, for assessing leasing proposals, for setting the rates that regulated organizations like electric utilities can charged to their customers, so on and so forth. A firm’s cost of capital is the weighted average cost of various sources of finance used by it, viz, equity, preference and debt.</p> <ol style="list-style-type: none"> 1. Cost of Debt :The cost of debt instrument is the yield to maturity of that instrument The cost of debt (k_d) can be calculated as the weighted average of the effective cost of the various loan facilities used by the company on which interest is explicitly charged (net-off after tax rate t). 2. Cost of Preference capital: Preference capital carries a fixed rate of dividend and is redeemable in nature. 3. Cost of Equity capital: <ol style="list-style-type: none"> a. CAPM We assume that the cost of equity can be estimated using the standard CAPM (capital asset pricing model): $k_e = r_f + (r_m - r_f) \times \beta$ In the equation, the excess return for the stock market is measured by the expression $(r_m - r_f)$, in which r_m is the return for a general stock exchange index calculated over a long period and r_f is the risk-free rate for government securities. β represents the stock risk. b. Dividend Growth Model Approach A model for determining the intrinsic value of a stock, based on a future series of dividends that grow at a constant rate. Given a dividend per share that is payable in one year, and the assumption that the dividend grows at a constant rate in perpetuity, the model solves for the present value of the infinite series of future dividends. 	

	<p style="text-align: center;">$\text{Stock Value (P)} = \frac{D}{k - G}$</p> <p>Where:</p> <p>D = Expected dividend per share one year from now</p> <p>k = Required rate of return for equity investor</p> <p>G = Growth rate in dividends (in perpetuity)</p> <p>c. <u>Bond Yield Plus Risk Premium Approach</u></p> <p>This is subjective procedure to estimate the cost of equity whereby the judgmental risk premium is added to the observed yield on the long term bonds of the firm to get the cost of equity:</p> <p>Cost of equity = Yield on long term bonds + Risk Premium</p> <p>What it means is that firms that have risky and consequently high cost debt will also have risky and consequently high cost equity.</p> <p>d. <u>Earning Price Ration Approach</u></p> <p>According to this approach, the cost of equity is equal to E_1 / P_0 where E_1 is the expected earnings per share for the next year, and P_0 is the current market price per share</p> <p>4. <u>Weighted Average Cost of Capital:</u> Given the cost of specific sources of finance and the scheme of weighting, the WACC, the WACC can be readily calculated.</p> <p>$WACC = W_E r_E + W_p r_p + W_D r_D (1 - t_c)$</p> <p>Where W_E, W_p and W_D are the proportion of equity, preference and debt and r_E, r_p and r_D are the component costs of equity, preference and debt and t_c is the corporate tax rate</p>	
<p>24.</p>	<p>What are the relative merits of building a project budget from "bottom-up and from the top-down methods"? How does the assignment of cost individual project activity help in effective cost and schedule control?</p>	<p>May 2012</p>
<p>ANS:</p>	<p>'Top Down' method of project budgeting is a quick and economical method to prepare project cost estimates with reasonable reliability when the detailed information about the project parameters is not available. It is also known as analogous estimation as it uses actual costs of previous similar project as a basis. However, reliability depends on the degree of similarity between projects, scalability of parameters and expertise of the estimating team in given field.</p>	

	<p>'Bottom Up' method involves estimating the cost of individual work items in the Work Breakdown Structure (WBS) and then summarizing or rolling up the individual estimates to get a project total. Cost of estimation and its accuracy depends upon size of individual work item in the WBS. Smaller work items increase time and cost of estimation but also increase its accuracy.</p>	
25.	<p>Short Note: Resource Levelling & Smoothing</p>	<p>May 2014, 2013, 2011, 2009</p>
ANS:	<p>Pg. 352 & 368</p>	
26.	<p>Short Note: Role of Consultant in Project Management</p>	<p>May 2014, 2013</p>
ANS:	<p>Role of consultant in project management is defined as <u>an expert who can contribute its valuable inputs at any stage or any aspect of project management:</u></p> <ol style="list-style-type: none">1. DEVELOP PROJECT CHARTER - Expert judgment is often used <u>to assess the inputs used to develop the project charter</u>. Such judgment and expertise is applied to any technical and management details during this process.2. DIRECT AND MANAGE PROJECT EXECUTION - Expert judgment is used to <u>assess the inputs needed to direct and manage execution of the project management plan</u>. Such judgment and expertise is applied to all technical and management details during this process. This expertise is provided by the project manager and the project management team using specialized knowledge or training. Consultant provide <u>additional expertise</u>.3. PERFORM INTEGRATED CHANGE CONTROL - In addition to the project management team's expert judgment, stakeholders may be asked to provide their expertise and may be asked to sit on the <u>change control board</u>. Such judgment and expertise is applied to any technical and management details during this process4. DEFINING SCOPE - Expert judgment is often used to <u>analyze the information needed</u> to develop the project scope statement. Such judgment and expertise is applied to any technical details.5. ESTIMATE RESOURCE ACTIVITY - Estimate Activity Resources is the process of <u>estimating the type</u>	

and quantities of material, people, equipment, or supplies required to perform each activity. Activity Resource process is closely coordinated with the Estimate.

For example: A construction project team will need to be familiar with local building codes. Such knowledge is often readily available from local sellers. However, if the local labor pool lacks experience with unusual or specialized construction techniques, the additional cost for a consultant might be the most effective way to secure knowledge of the local building codes.

6. **DEFINING BUDGET** - A company may not have in-house resource to accurately define the budget for the project in such cases consultant play an important role in advising company on estimating cost.

Some benefits of hiring a Project Management Consultant include:

- **Return on investment:** Consultants add value by using their skills and expertise to help deliver an outcome, solution, service or mitigate risk that provides a meaningful 'return on investment' to a client.
- **Speed:** Since consultants are already experienced and trained they can be deployed rapidly – sometimes within days as opposed to weeks or months. Their experience means they can engage promptly with the situation, and can quickly become effective in the client organization.
- **Expertise:** Project Management Consultants typically come into an organization at a relatively senior level and are expected to provide expertise and leadership
- **Objectivity:** Since they come from outside the client organization they are unencumbered by company politics or culture, and can provide a fresh perspective.
- **Accountability:** Project Management Consultants are not simply advisors. They are also practitioners and will take responsibility for and manage a project or programme.
- **Effectiveness:** Ideally, in order to be effective, a PM consultants will need to work well with senior management in the client company and also be granted some authority and credibility to effect significant change or transition within a company.
- **Commitment:** PM consultants should maintain high professional standards. They rely on their reputation and know that future work relies upon referrals and a successful track record.

But this begs the question – can a single project manager deliver all the skills and talents required. Sometimes the answer is yes, and other times its an emphatic NO. For the latter situation we have developed Project Management as a Service. You can read more about it [here](#), but basically we treat

	project management not as the responsibility of a single individual but something that is delivered by a team of specialists. Each specialist will have different levels of involvement at different times in the project.	
27.	<p>Short Note: Computerized Project Management</p> <p>Short Note: Information Technology and Project Management</p>	<p>May 2015, 2014</p> <p>May 2014, 2008, 2006</p>
ANS:	Above	
28.	<p>Short Note: Effect of Interest Rate on Project Economics</p> <p>Impact of interest rate on "Project Economics"</p>	<p>May 2014, 2013</p> <p>May 2013</p>
ANS:	<p>The cost of capital is affected by a number of factors. Some are beyond the firm's control, but others are influenced by its financing and investment policies.</p> <p>The three most important factors that are beyond a firm's direct control are:</p> <ul style="list-style-type: none"> (1) the level of interest rates, (2) the market risk premium, and (3) tax rates. <p>THE LEVEL OF INTEREST RATES</p> <ul style="list-style-type: none"> - If <u>interest rates in the economy rise, the cost of debt increases</u> because firms will have to pay bondholders a higher interest rate to obtain debt capital. - Also, the CAPM that higher interest rates also increase the costs of common and preferred equity. - During the 1990s, interest rates in the United States declined significantly. This reduced the cost of both debt and equity capital for all firms, which encouraged additional investment. <u>Lower interest rates</u> also enabled U.S. firms to <u>compete more effectively</u> with German and Japanese firms, which in the past had enjoyed relatively low costs of capital. <p>MARKET RISK PREMIUM</p> <ul style="list-style-type: none"> - The <u>perceived risk inherent in stocks, along with investors' aversion to risk</u>, determine the market risk premium. 	

	<ul style="list-style-type: none"> - Individual firms have no control over this factor, but it <u>affects the cost of equity</u> and, through a substitution effect, the <u>cost of debt</u>, and thus the <u>weighted average cost of capital</u>. <p>TAX RATES</p> <ul style="list-style-type: none"> - Tax rates, which are largely beyond the control of an individual firm (although firms do lobby for more favorable tax treatment), have an important <u>effect on the cost of capital</u>. - Tax rates are used in the calculation of the cost of debt as used in the weighted average cost of capital, and there are other less obvious ways in which tax policy affects the cost of capital. - For example, <u>lowering the capital gains tax</u> rate relative to the rate on ordinary income would make <u>stocks more attractive</u>, which would <u>reduce the cost of equity relative to that of debt</u>. That would lead to a change in a firm’s optimal capital structure toward less debt and more equity. 	
<p>29.</p>	<p>What is 'Sensitivity Analysis'? Discuss the relevance of Risk Analysis for a Comprehensive Project Evaluation.</p> <p>Short Note: Sensitivity Analysis & Work Breakdown Structure</p>	<p>May 2010, 2009</p> <p>May 2011, 2010, 2009, 2008</p>
<p>ANS:</p>	<p>WORK BREAK DOWN STRUCTURE:</p> <ul style="list-style-type: none"> - WBS in project management is a fundamental project management technique for defining and organizing the total scope of a project, using hierarchical tree structure. - WBS is a <u>deliverable oriented decomposition process</u> of a project into smaller components. - A well-designed WBS <u>describes planned outcomes</u> instead of planned actions. - A well-designed WBS makes it easy to assign any project activity <u>to one and only one terminal element of the WBS</u>. <p>SOME ESSENTIAL FEATURES OF WBS ARE:</p> <p>i) 100% Rule: The 100% rule states that the WBS includes 100% of the work defined by the project scope and captures all deliverables – internal, external and interim – in terms of work to be completed, including project management. The rule applies at all levels within the hierarchy: the sum of the work at the child level must equal 100% of the work represented by the parent and the WBS should not include any work that falls outside the actual scope of the project.</p> <p>ii) Mutually Exclusive Projects: The elements of the tree or Level-2 should be mutually</p>	

exclusive and should therefore, not have an overlap of activities. This is to ensure that the sum total of all the outcomes is 100% and not more than 100%

iii) **Plan outcomes and not actions:** The planned outcomes are the desired ends of the project and they form a relatively stable set of categories in which the cost of the planned actions needed to achieve them can be collected. If the WBS designer attempts to capture any action-oriented details in the WBS, he/she will likely include either too many actions or too few actions. Too many actions will exceed the 100% of parents' scope and too few actions will fall short.

iv) **Level of Detail:** Certain sets of details are required for WBS but the level of detail is not known. Certain heuristics aid in deciding the level of detail to which we have to work.

- One of the heuristics is the "80 hour rule" which means that no single activity or a group of activities to produce a single deliverable should require more than 80 hours of effort
- The 2nd heuristic is that no activity or series of activities should be longer than a single reporting period. Thus, if the project team is reporting progress monthly, no single activity or series of activities should have duration more than one month
- The last heuristic is "if it makes sense" rule. Here, one can apply common sense when creating duration of a single activity or group of activities

v) **Terminal Element:** The lowest element in a work breakdown structure which cannot be further subdivided

vi) **Misconceptions:**

- WBS is not an exhaustive list of work. It is instead a comprehensive classification of project scope
- WBS is not a project plan or a schedule or a chronological listing. It specifies **what would be done** and not how or when a task would be done
- WBS is not an organizational hierarchy, although it might be considered as such when assigning responsibilities

SENSITIVITY ANALYSIS:

Steps involved in Sensitivity Analysis–

(a) Set up relationship between basic underlying factors i.e. sales quantity, unit price, material & labor costs, project life etc. and the Net Present Value or IRR.

(b) Estimate range of variation and most likely value for each of the basic underlying factors

(c) Study the effect of variations in the basic variables on NPV or IRR; with one factor taken at a time.

It is a technique that measures the change in the profitability of a project caused by changes in the factors that affect the cash inflows of a project. If a small change in one factor leads to a major change in the profitability of the proposed investment, the project is considered more sensitive to that factor, in other words, the project is more risky. Other things being equal, a project that is less sensitive is preferable to projects that are more sensitive.

Example

Hind bulbs proposes to start a new venture for the manufacture of fluorescent bulbs.

The estimates of the new venture are as under :-

Output of bulbs per annum : 3 L Numbers

Expected Sales revenue / annum : Rs. 1.50 cr

Fixed Cost : Rs. 35 L

Variable Costs : Rs. 65 L

i) If the selling price comes down to Rs 40 per unit, find out its effect on BEP.

ii) If the fixed costs increase to Rs 40 L find out its effect on BEP.

iii) If the variable costs increase by 1 %, find out its effect on BEP.

Solution

Fixed cost Rs : 35,00,000

Sales Revenue Rs : 1,50,00,000

Selling price per unit = (150L / 3 L) = Rs 50

Variable cost per unit = (Rs. 66 L / 3 L) Rs 22

BEP is:

_____ Fixed Cost _____

Selling Price / Unit – V.C Per Unit

= ---35, 00,000 ----- = ----35, 00,000 ----- = 1.25,000 Units.

50 – 22

28

	<p><u>Selling Price / Unit comes down to Rs 40 L</u></p> <p>BEP = $\frac{35,00,000}{40-22} = \frac{35,00,000}{18} = 1,94,999$ Units.</p> <p><u>Fixed Cost increase to Rs 40 L</u></p> <p>BEP = $\frac{40,00,000}{50-22} = \frac{40,00,000}{28} = 1,42,875$ Units.</p> <p><u>Variable Cost increase by 10%</u></p> <p>Revised V.C. = / unit = (1.1 x 22) = Rs 24.20</p> <p>BEP = $\frac{35,00,000}{50-24.20} = \frac{40,00,000}{25.80} = 1,35,569$ Units.</p> <p>Results</p> <ol style="list-style-type: none"> 1. Reduction in selling price by 20 % , increases BEP by 56 % 2. Increase in F.C. by 14.21 % , Increases BEP by 9 % 3. Increase in V.C. by 10 % , Increases BEP by 9 % . Hence BEP is more sensitive to selling price. <p>NOTE: BEP (Sales) = Selling Price/Unit x BEP (Units)</p>	
30.	Short Note: External Commercial Borrowings	May 2014, 2013
ANS:		
31.	What are the major reasons for cost over runs and areas of cost which have tendency for over run and reason thereof?	May 2012
ANS:	<p>PROJECT COST OVERRUN is said to have taken place when the Actual Cost of Work Performed is more than the Earned Value (Budgeted Cost of Work Performed).</p> <p>PROJECT TIME OVERRUN is said to have taken place when the Budgeted Cost of Work Scheduled is more than the Earned Value (Budgeted Cost of Work Performed).</p>	

PROJECT COST OVERRUNS: (Macro Level)

1. Fund constraints
2. Land acquisition problems
3. Slow progress in areas other than civil works
4. Law and order
5. Delay in supply of equipment
6. Environmental clearance
7. Problems of technology selection
8. Award of contract
9. Delay in civil works
10. Geo-Mining
11. Court cases
12. Inadequate infrastructure
13. Bad weather
14. Govt. clearances

AREAS OF COST OVERRUNS: (Micro-level)

- Time overruns
- Changes in rates of foreign exchange and statutory duties
- High cost of environmental safeguards and rehabilitation measures
- Higher cost of land acquisition
- Change in the scope of the project
- Higher prices being quoted by the bidders in certain areas
- Under-estimation of original cost, and
- General price rise

AREAS OF TIME OVERRUNS FURTHER HAPPEN BECAUSE OF:

- Lack of supporting infrastructure facilities
- Delay in finalization of detailed engineering plans, release of drawings and delay in availability of funds
- Changes in scope/ delay in finalization of scope

	<ul style="list-style-type: none"> • Industrial relations and law and order problems • Delay and uncertainty in feedstock supply • Pre-commissioning teething troubles • Technology problems • Geological surprises 	
32.	<p>"PERT Network will act as only wall decorators in a business enterprise, since there are slippages of the project despite all the PERT Chart" Do you agree with this view? Explain</p>	May 2011
ANS:	<p>In 1958, the United States Navy needed a way to <u>monitor and control the Prolaris Missile Program</u>.</p> <ul style="list-style-type: none"> - It especially needed a method <u>for minimizing the conflicts, delays and interruptions</u> that so frequently plague accomplish that, the Navy developed the Program Evaluation and Review Technique (PERT). - PERT has several distinguishing characteristics: <ul style="list-style-type: none"> • It forms the basis for all <u>planning and predicting</u> and provides management with the ability to plan for best possible use of resources to achieve a given goal within time and cost limitations. • It provides visibility and enables management to <u>control "one-of-a-kind" programs as opposed to repetitive situations</u>. • It helps management handle the uncertainties involved in programs by answering such questions as <u>how time delays in certain elements influence project completion</u>, where slack exists between elements, and <u>what elements are crucial to meet the completion date</u>. This provides management with a means for evaluating alternatives. • It provides a <u>basis for obtaining the necessary facts</u> for decision making. • It utilizes a so-called time network analysis as the basic method <u>to determine manpower, material and capital requirements as well as providing a means for checking progress</u>. • It provides the <u>basic structure for reporting information</u>. • It <u>reveals interdependencies of activities</u>. • It <u>facilitates "what-if"</u> exercises. • <u>It identifies the longest path or critical path</u>. • It allows us to <u>perform scheduling risk analysis</u>. <p>A big advantage of PERT is the kind of planning required to create a major network. Network development and critical path analysis reveal interdependencies and problem areas that are neither</p>	

obvious nor well defined by other planning methods. The technique therefore determines where the greatest effort should be made for a project to stay on schedule.

The second advantage of PERT is that one can determine the probability of meeting specified deadlines by development of alternative plans. If the decision maker is statistically sophisticated, he can examine the standard deviations and the probability of accomplishment data. If there exists a minimum if uncertainty one may use the single-time approach, of course, while retaining the advantage of network analysis.

The third advantage is the ability to evaluate the effect of changes in the programs. For example, PERT can evaluate the effect of a contemplated shift of resources from the less critical activities to the activities identified as probable bottlenecks. Other resources and performance trade-offs may also be evaluated. PERT can also evaluate the effect of a deviation in the actual time required for an activity from what has been predicted.

Finally, PERT allows a large amount of sophisticated data to be presented in a well-organized diagram from which the contractor and customer can make joint decisions.

33. Discuss the steps involved in decision tree analysis and what are the pros and cons of decision tree analysis? May 2012

ANS:

Five Steps of Decision Tree Analysis

- 1. Define the problem.**
- 2. Structure or draw the decision tree.**
- 3. Assign probabilities to the states of nature.**
- 4. Estimate payoffs for each possible combination of alternatives and states of nature.**
- 5. Solve the problem by computing expected monetary values (EMVs) for each state of nature node.**

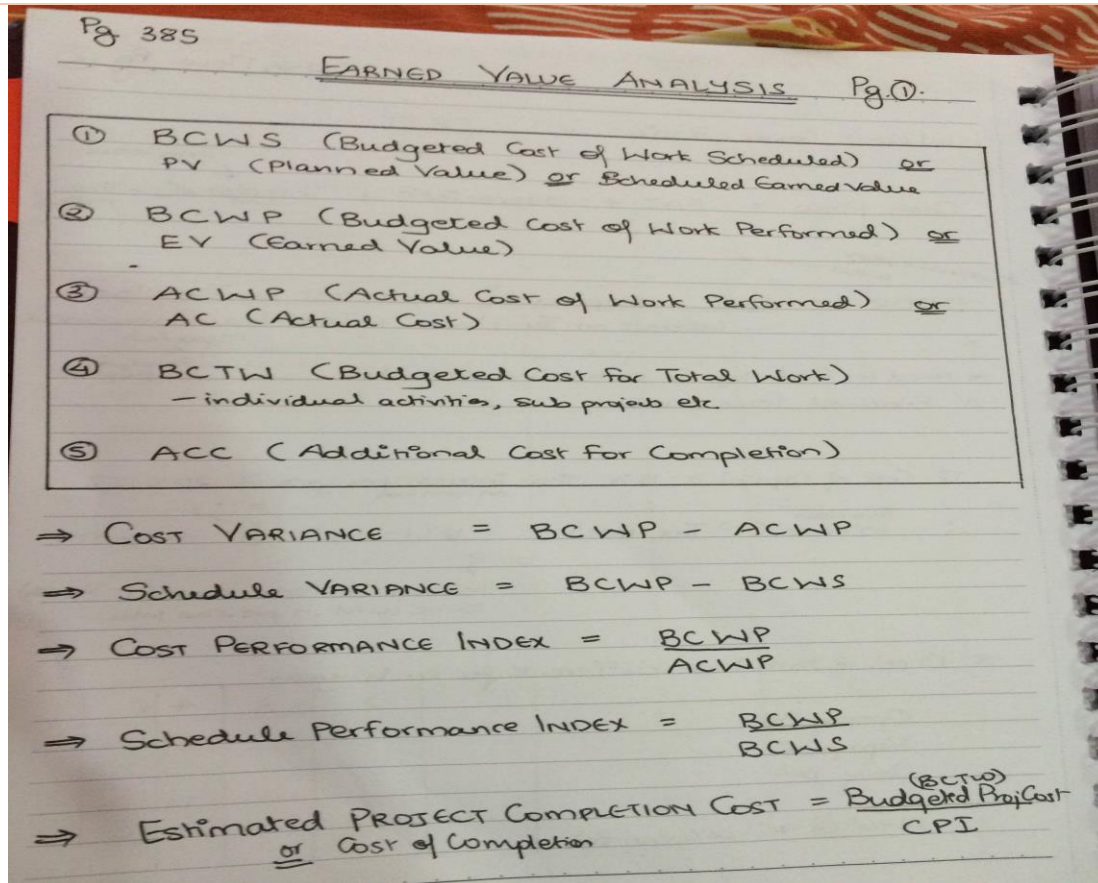
	<ul style="list-style-type: none"> • Pros <ul style="list-style-type: none"> + Reasonable training time + Fast application + Easy to interpret + Easy to implement + Can handle large number of features • Cons <ul style="list-style-type: none"> – Cannot handle complicated relationship between features – simple decision boundaries – problems with lots of missing data 	
34.	Project Communication Systems	May 2013
	<p>The Project Communications Management processes which include the following:</p> <ol style="list-style-type: none"> 1. IDENTIFY STAKEHOLDERS - The process of identifying all people or organizations impacted by the project, and documenting relevant information regarding their interests, involvement and impact on project success. 2. PLAN COMMUNICATIONS - The process of determining the project stakeholder information needs and defining a communication approach. 3. DISTRIBUTE INFORMATION - The process of making relevant information available to project stakeholders as planned. 4. MANAGE STAKEHOLDER EXPECTATIONS - The process of communicating and working with stakeholders to meet their needs and addressing issues as they occur. 5. REPORT PERFORMANCE - The process of collecting and distributing performance information, including status reports, progress measurements, and forecasts. <p>These processes interact with each other and with processes in the other Knowledge Areas. Each process occurs at least once in every project and, if the project is divided into phases, it could occur in one or more project phases.</p> <p><u>Communication activity has many potential dimensions, including:</u></p> <ul style="list-style-type: none"> ✚ Internal (within the project) and external (customer, other projects, the media, the public), ✚ Formal (reports, memos, briefings) and informal (emails, ad-hoc discussions), ✚ Vertical (up and down the organization) and horizontal (with peers), ✚ Official (newsletters, annual report) and unofficial (off the record communications), 	

- ✚ Written and oral, and
- ✚ Verbal and non-verbal (voice inflections, body language).

Most communication skills are common for general management and project management, such as, but not limited to:

- ✓ Listening actively and effectively,
- ✓ Questioning, probing ideas and situations to ensure better understanding,
- ✓ Educating to increase team's knowledge so that they can be more effective,
- ✓ Fact-finding to identify or confirm information,
- ✓ Setting and managing expectations,
- ✓ Persuading a person or organization to perform an action,
- ✓ Negotiating to achieve mutually acceptable agreements between parties,
- ✓ Resolving conflict to prevent disruptive impacts, and
- ✓ Summarizing, recapping and identifying the next steps.

35 **FORMULAE LIST**



EVA Pg 2

$$\Rightarrow \frac{\text{ACC or Total Cost Overrun}}{\text{Estimated Project Completion Cost}} = \frac{\text{Budgeted Project Cost (BCTW)}}{\text{Total original Budgeted Project Duration}}$$

$$\Rightarrow \text{Estimated Project Duration or Time of completion} = \frac{\text{Budgeted Project Duration}}{\text{SPI}}$$

$$\Rightarrow \text{ESTIMATED CPI} = \frac{\text{BCTW}}{\text{ACWP} + \text{ACC}}$$

$$\Rightarrow \text{TOTAL Cost Overrun} = \frac{\text{BCTW}}{\text{CPI}} - \text{BCTW}$$

$$\Rightarrow \text{Additional COST TO COMPLETE (ACC)} = \frac{\text{BCTW}}{\text{CPI}} - \text{ACWP}$$

There is ^{NO} difference betw Salvage & Scrap value for Depreciation

Cash Flow Pg ①

⑤ GENERATION OF CASH FLOW STATEMENTS

Particulars	0	1	2	3	4
Investment Outlay { Fixed Assets (Plant & Machinery)	120				
Working Capital (Plant & Machinery)	20				
Revenues					
Expense					
Additional Expense (Raw mat, variable mfg. cost, operating & maintenance, variable selig cost, OH allocation, incre. OH, loss of contribu, additional working capital)					
PBDIT					
Depreciation					
PBIT					
Interest					
PBT					
Tax					
PAT					
PAT + Depr + Int (term loans) <i>when cost of capital q/m</i>					
Salvage Value					
Working Capital Liquidated					

Cash Flow

- PV factor
- PV of Cash flow & NPV

Cash Flow Pg ②

$$\text{Interest Cover Ratio} = \frac{\text{PBIT}}{\text{Interest}}$$

$$\text{Cash Flow} = \text{PAT} + \text{Depreciat}^{\text{ion}} + \text{Interest}_{\text{amt.}} \times (1 - \text{Tax rate})$$

Term loan
↓

* Calculate AVG across years *

$$\text{DSCR} = \frac{\text{PAT} + \text{Depreciat}^{\text{ion}} + \text{Interest on Term loan}}{\text{Interest on Term loan} + \text{Term loan component repaid}}$$

↑
 * Need to find Avg. for each value reqd. above
 * Borrowed from bank

Principal Repayment
↑

IF Cost of Capital is 15% then interest per year = $120 \times 15\%$
 on term loan = 18

$$\begin{aligned} \therefore \text{Term loan Interest} (1 - \text{Tax Rate}) &= 18 (1 - 0.5) \quad \text{\{if Tax rate 50\%}\} \\ &= 9 \\ &= \text{Interest on Term loan} (1 - \text{Tax Rate}) \\ &\text{to be used in previous table} \end{aligned}$$

* Check if term loan different for each year.

	1	2	3	4	5
Opening Bal.					
Repayment					
Closing Bal.					
Interest @ ~% on opening Bal.					

PROJECT FINANCIAL APPRAISAL

PFA
Pg ①

① COMPOUND VALUE

$$M = P(1+i)^n \leftarrow \text{Accumulation Factor}$$

P = Principal amount invested

n = No. of investment periods

i = Rate of interest per period

M = Maturity amount

$(1+i)^n$ = Accumulation Factor } table available too

② PRESENT VALUE

$$P = M(1+i)^{-n} \leftarrow \text{Present Value Factor}$$

③ ANNUITIES & MATURITY VALUE OF ANNUITY

$$Q = A \frac{(R^n - 1)}{R - 1} = A \times \text{Amount factor}$$

$\frac{(R^n - 1)}{R - 1}$ ← Amount Factor

Q = Amount of annuity

A = Periodic Payments

n = Term of annuity (No. of payments)

i = Rate of Interest

* $(1+i) = R$

$$\frac{R^n - 1}{R - 1} = \text{Amount factor}$$

PFA - Pg. 2

④ PROJECT EVALUATION METHODS

(i) Payback Period Method (Rejection Analysis)

$$= \frac{\text{No. of years reaching initial investment}}{\text{next yr's total amount}} + \frac{\text{balance amount}}{\text{next yr's total amount}}$$

- * Shortest PBP is Ranked # 1
- * There is also discounted PBP where you consider discounted PV of cash inflows

(ii) Accounting Rate of Return (Rejection Analysis)

$$\text{ARR} = \frac{\text{Avg. Income}}{\text{Avg. Investment}} \times 100$$

Period	1	2	3	4	5	Average
EBITDA						
Depreciation						
EBIT						
Taxes						
Net Income						A
Book Value	Start	-	-	-	-	
	End	-	-	-	-	C
Average						B

$$\text{ARR} = \frac{A}{B - C} \times 100 = \text{---} \%$$

- * Max (Positive) ARR is Ranked # 1

Time Adjusted / Discounted Cashflow / Present Value Methods
 (iii) Net Present Value (Selection Analysis) PFA - Pg 3
 consider time value of money

$$NPV = \text{Present value of Cash Inflows} - \text{Present Cash Outflows}$$

* Positive (highest) NPV is ranked # 1

Period	Cash Flow of Project A	PV Factor @...%	PV of Cashflow
0	()	-	
1	-	Table yr 1	
2	-	" yr 2	
3	-	" yr 3	

Period	Cash Inflow EBITDA (120)	Depr	EBIT	EBIT-Tax		PAT + Dep	PV Factor	PV of Cash Inflow -120
				Tax @ 50%	PAT			
0								
1	25	15	10	5	5	20	0.8696	17.39
2	35	15	20	10	10	25	0.7561	18.90
3	45	15	30	15	15	30	0.6575	19.73
4	65	15	50	25	25	40	0.5718	22.87
5	65	15	50	25	25	40	0.4972	19.89

NPV → ○

Total PV Cash Inflow - Initial Investment.

If cash flow is the same (constant) across all years, use annuity table

While comparing using annuity method, if 2 projects have different no. of years, use

$$\boxed{\text{Equivalent annual annuity}} = \frac{NPV_A}{\text{Annuity PV Factor of A}} \quad \text{Vs} \quad \frac{NPV_B}{\text{Annuity PV Factor of B}}$$

PFA Pg ④

(iv) Internal Rate of Return = discount rate at which NPV = 0
 discount factor which equates cash inflow with cash outflow

$$IRR = 12\% + \frac{200}{(200 - (-100))} \times (14\% - 12\%)$$

Annotations: "discount factor of higher NPV" points to 12%; "higher NPV" points to 200; "discount factor of lower NPV" points to (14% - 12%); "lower NPV" points to (-100).

OR

$$IRR = 20\% + \frac{(20,709 - 20,000)}{(20,709 - 18,892)} \times (25\% - 20\%)$$

Annotations: "disc. factor of higher PV cash flow" points to 20%; "initial investment" points to 20,000; "disc. factor of lower PV cash flow" points to (25% - 20%); "higher PV cash flow" points to 20,709; "lower PV cash flow" points to 18,892.

* IF discount factor not given, consider as 10%

Year	0	1	2	3	4
Cash Flow	()				
PVF @ 10%					
PV of Cashflow					
NPV @ 10%					
PVF @ 20%					
PV of Cashflow					
NPV @ 20%					

PFA. Pg ⑤

(v) Profitability Index Method

NPV was based on absolute value of return. Did not compare project outflows to inflows
∴ PI helps compare!

$$PI = \frac{\text{Present Value of Cash Inflow}}{\text{Initial Cash Outflow}}$$

* Highest PI is Ranked # 1

(vi) Benefit Cost Ratio — better than PI

$$BCR = \frac{\text{Present value of Cash Inflows}}{\text{Present value of Cash Outflows}}$$

"Net Benefit Cost Ratio."

$$\text{Net BCR} = BCR - 1$$

* IF BCR > 1 (or NBCR > 0) then benefits are greater than cost

(vii) Common Time Horizon PERIOD METHOD

Eg: Project A life span - 3 yrs

Project B life span - 4 yrs

∴ We multiply $3 \times 4 = 12$ yrs. and compare projects to 12 yrs.

∴ The returns & investments of Project A $\times 4$ & Project B is $\times 3$

PROJECT NETWORK ANALYSIS

TFB
 PNA - Pg ①

① Critical Path Method (CPM) / Float Analysis

- Network based on activities
 - AOA Convention
 - Find ES, EF, LS, LF
- Total Float = LS - ES
- Interfering Float = Head Slack
- Free Float = Total Float - Interfering Float
- Independent Float = Free float - Tail Slack

② Program Evaluation & Review Technique (PERT)

- For projects where it is not possible to predict exact time
- Network based on events
- Optimistic time (t_o), Most likely time (t_m), pessimistic time (t_p)

Est. time:

$$t_e = \frac{T_o + 4T_m + T_p}{6} ; \sigma = \frac{t_p - t_o}{6}$$

Std. deviation individual
 ← only for critical path

Combined std dev (σ) = $\sqrt{\sigma_{1-2}^2 + \sigma_{2-3}^2 + \sigma_{3-5}^2}$

Std. Normal Variate

$$z = \frac{(t) - t_e}{\sigma}$$

← available days
 ← critical path duration
 } z value obtained from Normal

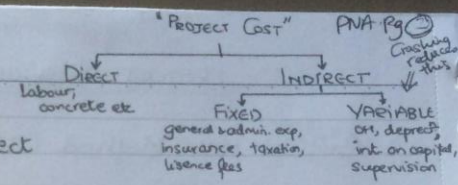
"2.505 ±" Distribution table

Project Completion Time

= Sum of all "Critical path" t_e . i.e. $t_{eA} + t_{eB} + t_{eC}$

Variance = σ^2

Path Activities	Crash 0	Crash 1	Crash 2
A-C-D	10+2+4 = 16	9+2+4 = 14	
A-B-C-D			



③ Crashing of A Project

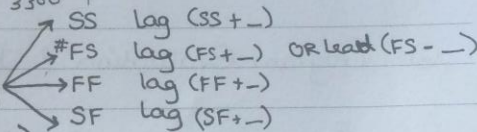
- Indirect cost reduces due to crashing
- Crash activities only on critical path
- Crashing not possible in PERT
- Point where total cost is the least is "Time-cost trade off" point or the optimum project cost point
- Max. Possible Crashing / Min. Project Duration Time

Cost Slope = $\frac{\Delta C}{\Delta T} = \frac{(C_c - C_n)}{(T_n - T_c)}$

n = normal activity
c = crashing

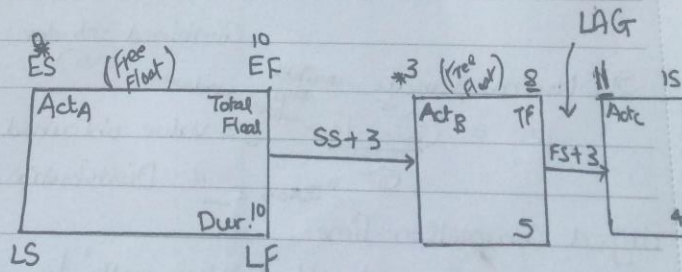
only for critical path activities

Crashing No.	Dur	Normal Cost	Crash Cost	Cum. Crash Cost	Total Cost	* Penalty / Bonus from total cost (+) / (-)
0	31	3100	0	0	3100	
1	27	3100	(3100 - 200)	200	3300	



④ Network using ADM (PRECEDENCE DIAGRAM METHOD)

- Succeeding activities can proceed simultaneously along with preceding activities
- Can have more than 1 start & more than 1 end
- Dummy activities not required in ADM
- Crossing of activity connectors not disallowed
- Provides lot of space for info like: Total float, Free float, ES, EF, LS, LF on the network itself



PMA Pg 3

AOA	AON
Every activity must have one start & one end.	Can have more than one start & more than one end
Dummy activities required	Dummy Activities not required
Crossing of activity connectors NOT allowed	Crossing of activity connectors allowed
AOA more popular due to early development.	AON active only over 70s hence, less popular
AOA forms the basis of PERT	All probabilistic projects cannot be shown with AON. <u>Reason:</u> AOA represents activity at nodes. PERT requires events at nodes
Can be used even in applications where there are different time estimates & standard deviations	ONLY used in deterministic projects
Crashing & Resource scheduling easy	Cubersome!
Less Space for Info.	Space to write LOT of info