

ECONOMICS FOR ENGINEERS

Economic Decision Making	2
Engineering Costs & Estimation	7
Cash Flow, Interest and Equivalence	23
Cash Flow & Rate of Return Analysis	28
Inflation and Price Change	43
Present Worth Analysis	53
Uncertainty in Future Events	61
Depreciation	78
Replacement Analysis	84
Accounting	87

NOTE:

MAKAUT course structure and syllabus of 6th semester has been changed from 2021. Previously **ECONOMICS FOR ENGINEERS** was in 5th semester. This has been redesigned and shifted in 6th semester as per present curriculum. Subject organization has been changed slightly. Taking special care of this matter we are providing chapterwise relevant MAKAUT university solutions and some model questions & answers for newly introduced topics, so that students can get an idea about university questions patterns.

ECONOMIC DECISION MAKING

Multiple Choice Type Questions

1. Which of the following statements is correct? [WBUT 2014]
- a) engineering economics provides a set of methods by which economic worth of alternatives can be compared
 - b) engineering economics never takes into account non-commercial considerations
 - c) engineering economics does not take into consideration tax liabilities of the firm
 - d) engineering economics is not applicable in the case of public sector undertakings
- Answer: (a)
2. In decision making risk is measured by [WBUT 2014]
- a) expectation b) mean c) variance d) median
- Answer: (c)
3. The firm's decision to invest its funds in fixed and long term assets is known as [WBUT 2015]
- a) Assets Planning
 - b) Capital Budgeting
 - c) Long Term Budgeting
 - d) Short Term Budgeting
- Answer: (b)
4. Which of the following is not applicable to bottom-up approach to cost estimation? [WBUT 2016]
- a) The project under consideration is considered at the highest aggregate level
 - b) The project under consideration is split into smaller parts and their respective components are identified
 - c) Cost estimates are made for each component of each small part and added up
 - d) Cost estimates are made for each component of each part of the project and are added up to arrive at the total
- Answer: (a)
5. Defined as the creative problem solving process of planning, organizing, leading, and controlling an organization's resources to achieve its mission and objectives. [MODEL QUESTION]
- a) Management b) Planning c) Organizing d) Supervision
- Answer: (a)
6. Refers to the activity combining "technical knowledge with the ability to organize and coordinate worker power, materials, machinery, and money." [MODEL QUESTION]
- a) Engineering Management
 - b) Engineering Materials

c) Engineering Organization

Answer: (c)

d) Engineering Club

7. The following are considered as functions of an engineer except

[MODEL QUESTION]

a) Testing

b) Construction

c) Sales

d) Physical Education

Answer: (a) & (b)

Short Answer Type Questions

1. Discuss the economic problems faced by an engineer with suitable examples.

[WBUT 2018]

Answer:

Some examples of engineering economic problems range from value analysis to economic studies. Each of these is relevant in different situations, and most often used by engineers or project managers. They are:

- **Value Analysis:** Proper value analysis finds its roots in the need for industrial engineers and managers to not only simplify and improve processes and systems, but also the logical simplification of the designs of those products and systems.
- **Linear Programming** is the use of mathematical methods to find optimized solutions, whether they be minimized or maximized in nature.
- **Interest and Money:** Time Relationships Considering the prevalence of capital to be lent for a certain period of time, with the understanding that it will be returned to the investor, money-time relationships analyze the costs associated with these types of actions. Capital itself must be divided into two different categories, *equity capital* and *debt capital*.
- **Depreciation and Valuation:** The fact that assets and material in the real world eventually wear down, and thence break, is a situation that must be accounted for. Depreciation itself is defined by the decreasing of value of any given asset, though some exceptions do exist. Valuation can be considered the basis for depreciation in a basic sense, as any decrease in *value* would be based on an *original value*.
- **Capital Budgeting** in relation to engineering economics, is the proper usage and utilization of capital to achieve project objectives. It can be fully defined by the statement; ... as the series of decisions by individuals and firms concerning how much and where resources will be obtained and expended to meet future objectives.
- **Minimum Cost Formulas** being one of the most important and integral operations in the engineering economic field is the minimization of cost in systems and processes. Time, resources, labor, and capital must all be minimized when placed into any system, so that revenue, product, and profit can be maximized.
- **Economic Studies**, both Private and Public in Nature Economic studies, which are much more common outside of engineering economics, are still used from time to time to determine feasibility and utility of certain projects. They do not, however, truly reflect the "common notion" of economic studies, which is fixated upon macroeconomics, something engineers have little interaction with.

POPULAR PUBLICATIONS

2. The management team of a small furniture manufacturing company is under pressure to increase profitability in order to get a much - needed loan from the bank to purchase a more modern pattern - cutting machine. One proposed solution is to sell waste wood chips and shavings to a local charcoal manufacturer and factory areas.
- a. Define the company's problem. Next reformulate the problem in a variety of creative ways.
 - b. Develop at least one potential alternative for your reformulated problems in part (a). (Don't concern yourself with feasibility at this point).

[MODEL QUESTION]

Answer:

a. The company's appears to be that revenues are not sufficiently covering costs. Several reformulations can be posed.

1. The problem is to increase revenues while reducing costs.
2. The problem is to maintain revenues while reducing costs.
3. The problem is an accounting system that provides distorted cost information.
4. The problem is that the new machine is really not needed (and hence there is no need for a bank loan).

b. Based only on reformulation 1, an alternative is to sell wood chips and shavings as long as increased revenue exceeds extra expenses that may be required to heat the buildings. Another alternative is to discontinue the manufacture of specialty items and concentrate on standardized, high volume products. Yet another alternative is to pool purchasing, accounting engineering and other white-collar support services with other small firms in the area by contracting with a local company involved in providing these services..

3. X, a moneymaker prides himself on how much money he can save by being frugal. Today, Stan needs 15 gallons of gasoline to top off his automobile's gas tank. If he drives eight miles (round trip) to a gas station on the outskirts of costs Rs.3.00 per litre and his car gets 25 Km per litre for in - town driving.

Should he make the trip to get less - expensive gasoline? Each mile that he drives creates one pound of carbon dioxide. Each pound of CO₂ has a cost impact of Rs.0.02 on the environment. What other factors (cost and other wise) should he in his decision making?

[MODEL QUESTION]

Answer:

Because each pound of CO₂ has a penalty of Rs.0.02, the saving's from his trip = (15 litres × Rs.0.10) - (8 Km × Rs.0.02) = Rs.1.34. If he can drive his car for less than Rs.1.34/8 = Rs.0.1675 per Km, he should make the trip. The cost of gasoline only for the trip is (8Km/25 Km per litre).

(Rs.3.00 per litre) = Rs.0.96, but other costs of driving, such as insurance, maintenance and depreciation may also influence his decision. What is the cost of an accident, should Stan have one during his trip to purchase less - expensive gasoline? If he makes the trip weekly for a year, should this influence his decision?

Long Answer Type Questions

1. Discuss the principles of Engineering Economy. [MODEL QUESTION]

Answer:

Principle – 1: Develop the alternatives:

The choice (decision among alternatives, the alternatives need to be identified and then defined for subsequent analysis).

Principle – 2: Focus on Differences

Only differences in expected future outcomes among the alternatives are relevant to their comparison and should be considered in the decision.

Principle – 3: Use a consistent Viewpoint

The prospective outcomes of the alternatives, economic and other should be consistently developed from a defined view point (perspective).

Principle – 4: Use a common unit of measure

Using a common unit of measurement to enumerate as many of the prospective outcomes as possible will simplify the analysis of the alternatives.

Principle – 5: Consider All Relevant Criteria

Selection of a preferred alternative (decision making) requires the use of a criterion or several criteria). The decision process should consider both the outcomes enumerated in the monetary unit and those expressed in some other unit of measurement or made explicit in a descriptive manner.

Principle – 6: Make risk and Uncertainty Explicit

Risk and uncertainty are inherent in estimating the future outcomes of the alternatives and should be recognized in their analysis and comparison.

Principle – 7: Revisit Your Decisions

Improved decision making results from an adaptive process, to the extent practicable, the initial projected outcomes of the selected alternatives should be subsequently compared with actual results achieved.

2. A firm must decide between two system designs s1 and s2, whose estimated cash flows are shown in the following table. The effective income tax rate is 40% and MARCS (GDS) depreciation is used. Both designs have a GDS recovery period of five years. If the after - tax desired return on investment is 10% per year, which design should be chosen? [MODEL QUESTION]

	Design	
	s1(Rs.)	s2(Rs.)
Capital investment	100,000	200,000
Useful life (years)	7	6
MV at end of useful life	30,000	40,000

Answer:

Note that the design alternative has different useful lives. The same bases principles of engineering economy apply to both before tax and after tax analyse. Therefore, we must analysis the two system designs over a common period of time. As we discovered in

POPULAR PUBLICATIONS

using the repeatability assumption along with the annual worth method it simplifies the analysis of alternatives having unequal lives.

Both alternatives would be depreciated using a five - years GDS recovery period. No adjustments to the GDS rate are required because the useful life of each alternative is greater than or equal to six years of depreciation deductions summarizes the calculation of the ATCFs for the design alternatives. We can't directly compare the PW of the after tax cash flows because of the difference in the lives of the alternatives. We can directly compare the AWs of the ATCFs by using the repeatability assumption from

$$AWs_1(10\%) = PWs_1(A/P, 10\%, 7) = -1,411(0.254) = -290 \text{ Rs.}$$

$$AWs_2(10\%) = PWs_2(A/P, 10\%, 6) = -16,681(0.2296) = -3,830 \text{ Rs.}$$

Based on an after-tax annual worth analysis, Design S1 is preferred since it has the greater (less negative) AW. Neither design makes money, so if a system is not required, don't recommend either one.

ENGINEERING COSTS & ESTIMATION

Multiple Choice Type Questions

1. Costs reflected in accounting system only are called [WBUT 2012]
a) Cash cost b) Overhead cost c) Book cost d) Direct cost

Answer: (c)

2. The opportunity cost of a good is [WBUT 2012, 2014, 2017, 2019]
a) the time lost in finding it
b) the quantity of other goods sacrificed to the another unit of that good
c) the expenditure on the good
d) the loss of interest in using saving?

Answer: (b)

3. To compute the construction cost per square foot of a building
a) Per unit model will be used [WBUT 2012, 2017]
b) Segmenting model will be used
c) Learning curve estimation process will be used
d) None of these

Answer: (a)

4. Which one is fixed cost? [WBUT 2012, 2017]
a) Depreciation of fixed assets b) Excise duty
c) Cost of advertising d) Sales tax.

Answer: (c)

5. What is the relationship between Marginal cost (MC) and Average cost (AC) curves? [WBUT 2013]
a) AC cuts the MC from below b) MC cuts the AC from below
c) AC and MC do not cut each other d) there is no fixed relationship

Answer: (b)

6. To compute the updated cost of a boiler of the same capacity in a power plant, we use [WBUT 2013]
a) per unit model
b) segmenting model
c) cost index model
d) none of these

Answer: (c)

7. The value of the Power-Sizing Exponent (E) indicates Diseconomies of Scale when [WBUT 2014]
a) $0 \leq E < 1$ b) $E > 1$ c) $E < 0$ d) $E = 1$

Answer: (b)

POPULAR PUBLICATIONS

8. Learning Curve is applicable to the industries with [WBUT 2014]
a) low labour turn over
b) high labour turn over
c) huge mechanization
d) high variable cost

Answer: (b)

9. If in a power sizing model the power sizing index is greater than 1, then [WBUT 2016]
a) Per unit price increases with increase in quantity
b) Per unit price decreases with increase in quantity
c) Per unit price remains constant with increase in quantity
d) Per unit price remains constant with decrease in quantity

Answer: (a)

10. A portion of the learning curve is [WBUT 2016]
a) Parallel to y axis
b) Parallel to x axis
c) Cuts the x axis
d) Cuts the y axis

Answer: (c)

11. What is the relation between the slopes of Total Cost (TC) and Total Revenue (TR) curves? [WBUT 2016]
a) Slope of TR > Slope of TC
b) Slope of TR < Slope of TC
c) Slope of TR = Slope of TC
d) No fixed relation

Answer: (d)

12. Sunk cost is [WBUT 2016]
a) Original investment + depreciation – repairing expenses
b) Original investment – depreciation + repairing expenses
c) Original investment + depreciation + repairing expenses
d) Original investment – depreciation – repairing expenses

Answer: (c)

13. Which of the following is not applicable to bottom-up approach to cost estimation? [WBUT 2016]
a) The project under consideration is considered at the highest aggregate level
b) The project under consideration is split into smaller parts and their respective components are identified
c) Cost estimates are made for each component of each small part and added up
d) Cost estimates are made for each component of each part of the project and are added up to arrive at the total

Answer: (a)

14. Cost reflected in accounting system only is called [WBUT 2017]
a) Cash cost
b) Overhead cost
c) Book cost
d) Direct cost

Answer: (c)

15. The following value(s) of the Power-Sizing Exponent (E) indicates Economies of scale [WBUT 2018]

- a) $0 < E < 1$ b) $E > 1$ c) $E = 0$ d) $E = 1$

Answer: (a)

16. Marginal cost curve cuts the Average Variable cost from [WBUT 2019]

- a) Above at its minimum point
c) Below at its minimum point

- b) Below at its falling part
d) None of these

Answer: (a)

17. To compute the updated cost of a boiler with same capacity in a power plant, we use [WBUT 2019]

- a) Per Unit Cost Model
c) Power Sizing Model

- b) Cost Index Model
d) Segmenting Model

Answer: (b)

Short Answer Type Questions

1. Labour cost index value was at Rs. 124, ten years ago and is Rs. 188 today. Annual labour costs for similar facility were Rs. 5,75,500 ten years ago. Develop the cost estimates of annual labour cost for today. [WBUT 2013]

Answer:

According to cost index model,

$$\frac{\text{Cost at current time}}{\text{Cost at past time}} = \frac{\text{Index value at current time}}{\text{Index value at past time}}$$

$$\therefore \frac{\text{Annual labour cost today}}{\text{Annual labour cost ten years ago}} = \frac{\text{Labour cost index today}}{\text{Labour cost index ten years ago}}$$

$$\Rightarrow \frac{\text{Annual labour cost today}}{5,75,500} = \frac{188}{124}$$

$$\Rightarrow \text{Annual labour cost today} = 8,72,532 \text{ Rs.}$$

2. Distinguish between fixed cost and variable cost with diagrams. [WBUT 2014]

Answer:

Fixed Cost	Variable Cost
1. They are not a function of output.	1. They are function of output in the production period.
2. They do not vary with output upto a certain level or activity.	2. They vary directly and sometime proportionately with the output.
3. They are incurred in hiring the fixed factors of production whose amount cannot be adjusted in short time.	3. They are incurred in employment of the variable factors of production whose amount can be altered in the short run.

Fixed Cost	Variable Cost
<p>4. They cannot be avoided until the operations of the firm are completely closed down, in the event of shut-down of operations they are to be borne.</p> <p>5. They are also called contractual cost.</p>	<p>4. They can be avoided if a firm shuts down in the short run, then it will not incur variable costs.</p> <p>5. They are also called prime cost or direct costs.</p>
<p>A graph showing Fixed Cost (FC) on the vertical axis and Unit on the horizontal axis. A horizontal line starts from the origin (0) and extends upwards, representing a fixed cost that remains constant regardless of the quantity produced.</p>	<p>A graph showing Variable Cost (VC) on the vertical axis and Unit on the horizontal axis. A straight line starts from the origin (0) and slopes upwards linearly, representing a variable cost that increases directly proportional to the quantity produced.</p>

3. Write a short note on recurring and nonrecurring cost.

[WBUT 2015]

Answer:

Recurring costs are almost predetermined expenses which are incurred in regular intervals. These expenses form part of the operating expenses for *running the business process*. e.g., *salary expenses, repairs and maintenance*. The benefits derived out of these types of expenses are generally short term and the expenses are to be incurred in regular intervals to maintain the benefit out of it.

On the other hand the non-recurring costs occur at irregular intervals and generally not predetermined and thus may not be always a part of regular budgeting process. e.g., Repair expenses incurred due to breakdown of machines, plan to purchase machineries due to a subsequent huge order received.

Non-recurring costs might be planned also in some cases like overhauling of plant and machinery is done in planned manner but still not very regular thus non recurring expenses whereas breakdown maintenance cost is an unplanned expenses.

In engineering the recurring cost are considered of having an interval of almost 1 to 4-5 years gap which are easily anticipated beforehand. Non recurring expenses are made in huge interval gap and various models are made to figure out or anticipate the expenses although it is not easy to do.

4. a) What is Estimation?

b) An Electricity company wants to replace its Machinery which was erected in the year 1982 at a cost of Rs. 15,00,000 with a capacity of 300 MW. This consists of material, labour and overhead in the ratio of 5 : 3 : 2. The present cost index of material, labour and overheads are 250, 300 and 240 respectively. The company wants to increase double of its present capacity. You are required to determine the present cost of Machinery to be replaced with double capacity by using cost indexes and power-sizing model. The power sizing factor is 0.90.

[WBUT 2016]

Answer:

a) Estimation (or estimating) is the process of finding an estimate, or approximation, which is a value that is usable for some purpose even if input data may be incomplete, uncertain, or unstable. The value is nonetheless usable because it is derived from the best information available. Typically, estimation involves "using the value of a statistic derived from a sample to estimate the value of a corresponding population parameter". The sample provides information that can be projected, through various formal or informal processes, to determine a range most likely to describe the missing information. An estimate that turns out to be incorrect will be an overestimate if the estimate exceeded the actual result, and an underestimate if the estimate fell short of the actual result.

b) Cost of machinery of original capacity

Material: $15,00,000 \times \frac{5}{5+3+2}$	= 7,50,000 Rs.
Labour: $15,00,000 \times \frac{3}{10}$	= 4,50,000 Rs.
Overhead: $15,00,000 \times \frac{2}{10}$	= 3,00,000 Rs.
Total Cost	= 15,00,000 Rs.

Cost of present machinery of double capacity

Material: $7,50,000 \times \frac{250}{100} \times \left(\frac{2}{1}\right)^{0.90}$	= 34,98,881 Rs.
Labour: $4,50,000 \times \frac{300}{100} \times \left(\frac{2}{1}\right)^{0.90}$	= 25,19,195 Rs.
Overhead: $3,00,000 \times \frac{240}{100} \times \left(\frac{2}{1}\right)^{0.90}$	= 13,43,570 Rs.
Total Cost	= 73,61,646 Rs.

5. Define Learning Curve, What are the limitations of Learning Curve? [WBUT 2017]

Answer:

1st part: Refer to Question No. 1(a) of Long Answer Type Questions.

2nd part:

Limitations of Learning Curve are

Cost of Entry: Every activity in which a human can engage has a cost of entry. For example, if a person chooses to play a new video game, the cost of entry is purchasing the game plus whatever time it takes to master the controls. Activities with steep learning curves have a high cost of entry since participants must spend more of their time learning

POPULAR PUBLICATIONS

the basics before they can truly enjoy themselves. A high cost of entry may turn off potential customers or participants who decide that your product's steep learning curve simply is not worth their time.

Frustration: Any time you learn something new, there is a chance for frustration to build. New tasks are unfamiliar and require careful attention, and in activities with steep learning curves, mistakes can be quite costly. If you were trying to teach a person to sculpt marble, for example, every mistake could cost that person hundreds of dollars in supplies. When the amount of frustration experienced by a person learning a task outweighs his potential enjoyment of that task, he is more likely to quit than continue. A steep learning curve may force new customers to walk away from a product or service before truly experiencing its benefits.

Exclusion: One of the benefits of offering an activity with a steep learning curve is the participants that hang around are truly dedicated to the task. By weeding out people with casual interests or low frustration barriers, you ensure that your customers are all of a certain mindset and caliber. A steep learning curve is an easy way to keep people who may not stick with a given activity or product from wasting too much of your time, as it pushes them out much earlier than they would naturally lose interest.

Satisfaction: When a service or product has a steep learning curve, the people who do stick around to master it feel an immense sense of accomplishment they would not get if the product were simple to use. Following the example of video games again, in games with high difficulty levels and brutal learning curves, the gamer who sticks it out to the end is going to feel a greater sense of satisfaction from completing the game than she would if the game were easy from start to finish. Steep learning curves may keep some people away, but they can also keep some people coming back for more.

6. Write a brief note on Per Unit Cost method of estimation.

[WBUT 2019]

Answer:

The per-unit model is a simple but useful model in which a cost estimate is made for a single unit, then the total cost estimate results from multiplying the estimated cost per unit times the number of units.

This model is applicable for those types of product where various cost components like raw materials, labour and other overheads cost are identifiable and determined for a single unit of production.

The unit cost method of estimation can be used for project design estimates as well as for bid estimates.

Long Answer Type Questions

1. a) What do you mean by Learning Curve method in cost estimation?
 b) A certain index for the cost of purchasing and installing utility boilers is keyed to 1988, where its baseline value was arbitrarily set at 100. Company XYZ installed a 50,000 lb/hour boiler for \$525,000 in 2000 when the index had a value of 468. This same company must install another boiler of the same size in 2007. The index is 2007 is 542. What is the approximate cost of the new boiler? [WBUT 2012]

Answer:

a) The learning curve has to do with the ways people improve their performance of certain tasks. For every job, the operator has to be trained although for simple jobs ordinary instructions sheet is sufficient for training the operator but for complex job further training is required so that the operator can perform the tasks with sufficient skills. While determining the extent of training required, the ability of the operator to learn and adapt to new methods is also a factor to be considered. While learning a new method, the operator gather speed quickly at first but with practice, the improvement will be there but the rate of improvement will be slow. The cycle of practice are plotted on the X axis and time per cycle on the Y axis in the learning curves. The learning curve, therefore is a graph which represents the relationship between the practice time and the speed of work and the formula is as follows:

$$\frac{L}{Q} = N(e^Q) - i$$

where L = Labour input, Q = Current output e^Q = accumulated past work, N = a constant and i = a constant which is less than 1.

The learning curve model is usually applied to direct labour, rejects, defective products and also overheads because overheads are also affected by learning as they are related to direct labour.

b) The cost of new boiler of same size as installed in 2000
 index value at current year (2007)
 = cost of old boiler installed in 2000 ×
 index value at past year (2000)

$$= 5,25,000 \times \frac{542}{468} = 6,08,013\$ \text{ (approx.)}$$

2. Discuss the meaning of estimation. What are the advantages in engineering economic analysis? Discuss its limitations. [WBUT 2013]

Answer:

In statistics, estimation refers to a process in which one makes influences about a population. An estimation of population parameters may be estimated in two ways: (i) if the estimate consists single value or point then it is called point estimate (2) if the estimate give a range of value then it is called interval estimate.

POPULAR PUBLICATIONS

The advantages of engineering economic analysis are:

- i) Promotion of well-being and survival of the organization.
- ii) Embody creative and innovative technology and ideas.
- iii) Translate profitability to the bottom-line through a valid and acceptable measure of return.
- iv) Taking appropriate decisions to apply such methods directed towards minimizing costs / maximizing benefits.

The main limitation of engineering economic analysis is that there is a major need to consider aspects of ethical and value based considerations as well as to incorporate concepts of corporate social responsibility in engineering.

3. a) Distinguish between Marginal Cost and Average Cost. Draw both the graphs in a single graph paper.

b) If $C(x) = x^3 + 5x^2 + 3x + 500$, find

- i) Fixed Cost
- ii) Variable cost
- iii) Average Cost
- iv) Marginal Cost
- v) Average Variable Cost.

[WBUT 2015]

Answer:

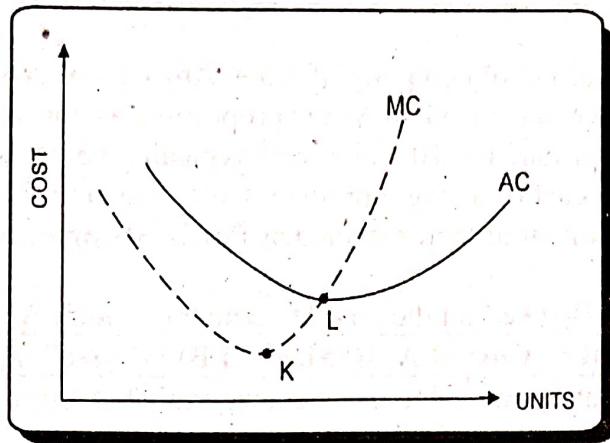
a) The average cost is obtained by dividing total cost of production by the number of units of the commodity produced so that

$$\text{Average cost} = \frac{\text{Total cost}}{\text{output}}$$

Marginal cost is the cost of production of final or the marginal unit of the commodity. Alternately it may be expressed as the total cost of n unit of the output minus the total cost of $n-1$ unit. Both averages as well as the marginal cost curves are normally U-shaped curves.

The relationship between marginal cost and average cost is as follows:

1. If average cost is falling, then, MC is below average cost
2. If AC is constant, then $MC = AC$.
3. If AC is rising, then $MC > AC$, i.e., MC is above AC.



b) Given, $C(x) = x^3 + 5x^2 + 3x + 500$

i) Fixed cost = 500

ii) Variable cost = Total cost - Fixed cost = $C(x) - 500 = x^3 + 5x^2 + 3x$

iii) Average cost = $\frac{C(x)}{x} = \frac{x^3 + 5x^2 + 3x + 500}{x} = x^2 + 5x + 3 + \frac{500}{x}$

iv) Given, total cost = $C(x) = x^3 + 5x^2 + 3x + 500$

∴ Marginal cost = $\frac{d}{dx}\{C(x)\} = 3x^2 + 10x + 3$

v) Average variable cost = $\frac{\text{Variable cost}}{\text{Output}} = \frac{x^3 + 5x^2 + 3x}{x} = x^2 + 5x + 3$

4. Explain the types of estimate. What are the difficulties in estimation? What do you mean by Cost Index? [WBUT 2015]

Answer:

1st part:

Types of Cost Estimate – Models are described below:

Per-unit Model

Here in this model a cost estimate is made for a single unit, then the total cost estimate results from multiplying the estimated cost per unit times the number of units. This model is applicable for those types of product where various cost components like raw materials, labour and other overheads cost are identifiable and determined for a single unit of production.

Segmenting Model

Here partitions the total estimation task into segments. Each segment is estimated, and then the segment estimates are combined for the total cost estimate. Like if cost for any student fest to be calculated first it is segmented into the category of decoration, artiste cost, entertainment and food, travelling, advertisement etc. cost of each segment is calculated and then added to derive the total cost.

POPULAR PUBLICATIONS

Power-Sizing model

This is practically an effect of economy of scale. Any cost of producing / manufacturing any product will not be increased in same proportion as the units are increased. For example, the cost of producing 10 units will typically be less than ten times of the comparable production cost of a single product. Cost of economic comparable production cost depends on an exponential factor termed as Power Sizing Exponent

To estimate the cost of B based on the cost of comparable item A, use the equation

$$\text{Cost of B} = (\text{Cost of A}) [(\text{"Size" of B}) / (\text{"Size" of A})]^x$$

Here X is the appropriate power-sizing exponent, available from a variety of sources of past performance of production.

Learning Curve Model

Here cost estimating is based on the assumption that as a particular task is repeated and the operator systematically becomes quicker at performing the task. In particular, the model is based on the assumption that the time required to complete the task for production unit $2x$ is a fixed percentage and will be less than the double of the time required for production unit x for all positive, integer x . e.g., if 5 hrs is required for producing a single unit and the learning rate is 80 % then to producing 2 units will be $5 \times 2 \times 80\% = 8$ hrs. and producing double the units i.e., 4 units will be $8 \text{ Hrs.} \times 2 \times 80\% = 12.8$ hrs.

2nd part:

Difficulties in cost estimation

Estimating is difficult because the future is unknown. With few exceptions (such as with legal contracts) it is difficult to anticipate future economic consequences exactly. In this section we discuss several aspects of estimating that make it a difficult task. Engineering economic analysis includes present and future economic factors; thus, it is critical to obtain reliable estimates of future costs, benefits and other economic parameters. Difficulties in developing cost estimates arise from such conditions as one-of-a-kind estimates, resource availability, and estimator expertise. Generally the quality of a cost estimate increases as the resources allocated to developing the estimate increase. The benefits expected from improving a cost estimate should outweigh the cost of devoting additional resources to the estimate improvement.

3rd part:

A cost index is the ratio of the actual price in a time period compared to that in a selected base period (a defined point in time or the average price in a certain year), multiplied by 100. Raw materials, products and energy prices, labor and construction costs change at different rates, and plant construction cost indexes are actually a composite, able to compare generic chemical plants capital costs.

ECONOMICS FOR ENGINEERS

To update an item cost (equipment, projects) from period A to period B, is necessary to multiply period A's cost by the ratio of period B's index over period A's index, according to the following equation:

$$\text{Cost at A} = \text{Cost at B} \cdot \frac{\text{index at A}}{\text{index at B}}$$

As a rule-of-thumb, cost indexes permit fairly accurate estimates for cost escalation if the difference between period A and period B is less than 10 years. Differences between the actual equipment and labor prices and those predicted by the index tend to grow over the years, surpassing the typical error verified in budget-level estimates. The selection of the proper index to use depends on the industry in which it is applied. For example, while CE, M&S or IC Index are typically employed for chemical process industries, the ENR (Engineering News-Record) construction index is used for general industrial construction and takes in account the prices for fixed amounts of structural steel, cement, lumber and labor.

The majority of cost indexes demonstrate a time lag, due to data collection and its compilation for publishing. As stated before, some indexes use information published by other organizations and a delay in data may be verified (like those provided by the BLS). Exceptions to this are the ENR construction and the IC indexes, which present relatively current values.

5. a) Describe different areas of management decision.
b) Dimpy Co., a radio manufacturing company finds that the existing cost of a component, Z 200, is Rs. 6.25. The same component is available in the market at Rs. 5.75 each, with an assurance of continued supply.

The breakup of the existing cost of the component is:

	Rs.
Materials	2.75 each
Labour	1.75 each
Other variables	0.50 each
Depreciation and other Fixed cost	1.25 each
	<u>6.25</u>

- i) Should the company make or buy? Present the case, when the firm cannot utilize the capacity elsewhere, profitably and when the capacity can be utilized, profitably.
ii) What would be your decision, if the supplier has offered the component at Rs. 4.50 each? [WBUT 2016]

Answer:

a) Different areas of management decisions are -

- i) Operation management
- ii) Quality management
- iii) Materials management
- iv) Finance management
- v) Human resource management
- vi) Marketing management
- vii) Project management

POPULAR PUBLICATIONS

viii) Systems management

b) When the firm cannot utilize the capacity elsewhere

	Z 200 (per unit)
Materials	2.75
Labour	1.75
Other variables cost	0.50
Variable cost of manufacture	5.00

Since variable cost of manufacture is less than supplier's price, therefore the company should make the product

When the firm can utilize the capacity elsewhere

	Z 200 (per unit)
Supplier's price	5.75
Less: Variable cost of manufacture	5.00
Difference	0.75

In this case

- If the firm can get a contribution more than 0.75 Rs. per unit of the component by utilizing the capacity elsewhere, then they should buy the component.
- If the firm cannot get a contribution at least equal to 0.75 Rs. per unit, then by utilizing the capacity elsewhere then it should make the component.
- If the supplier has offered the component at 4.50 each, then the firm should buy the component because by buying it will gain an amount of $(5.00 - 4.50) = 0.50$ Rs. per unit than making.

6. a) Differentiate elaborately between Absorption Costing and Marginal costing.

[WBUT 2017]

Answer:

Marginal costing and absorption costing differ from each other in the following respects.

- Cost elements in product cost:** Marginal costing and absorption costing differ only in the treatment of fixed factory (manufacturing) overheads in the accounting records and financial statement. In both the costing it is agreed that selling and administrative expenses, whether variable or fixed, are period costs and these costs are not treated as product costs with the result that selling and administrative expenses are not included in the costs of inventories and costs of goods sold. Similarly it is also agreed that variable manufacturing costs are product costs, i.e., costs to be charged to the product. The disagreement between the two is only in regard to the treatment of fixed manufacturing costs. Under absorption costing, fixed manufacturing costs are charged to inventory and costs of goods sold. Under marginal costing, these costs are not charged to inventory and cost of goods sold but are treated as period expenses when incurred.
- Inventory values:** Marginal costing is relatively at a lower figure as inventories are determined in terms of only variable production costs. In absorption costing, the

- value of inventories is comparatively at a higher figure because it considers fixed factory overhead also besides the variable production costs.
3. **Difference in net income:** The treatment of fixed factory overhead brings differences in the net income figures in the two costing techniques. The manufacture of any difference in net income is a function of fixed manufacturing costs per unit and the change in inventory levels.

b) Variable cost per unit is Rs. 12. Selling price per unit is Rs. 20. Fixed expenses are Rs. 60,000. Find BEP. What will be the selling price per unit if the BEP is brought down to 6000 units? [WBUT 2017]

Answer:

$$\text{B.E.P (units)} = \frac{\text{Fixed cost}}{\text{Contribution (per unit)}} = \frac{\text{Fixed cost}}{\text{Selling Price (pu)} - \text{Variable cost (pu)}}$$

$$= \frac{60,000}{20 - 12} = \frac{60,000}{8} = 7,500 \text{ units}$$

$$\text{B.E.P (Rs.)} = \frac{\text{Fixed cost}}{p/v \text{ ratio}} = \frac{\text{Fixed cost}}{\frac{\text{contribution (pu)}}{\text{Sellingprice (pu)}}} = \frac{60,000}{\frac{8}{20}} = \frac{60,000 \times 20}{8} = 1,50,000 \text{ Rs.}$$

When B.E.P is brought down to 6,000 units

$$6,000 = \frac{60,000}{\text{Selling price per unit (Required)} - 12}$$

Assuming Fixed expenses and Variable Cost (per unit) remaining constant.
i.e., $6,000 = \frac{60,000}{\text{S.P (pu)} - 12}$

$$\Rightarrow \text{S.P (pu)} - 12 = 10$$

$$\Rightarrow \text{S.P (pu)} - 12 = 10 + 12 = 22 \text{ Rs.}$$

Therefore the required selling price per unit = 22 Rs.

7. a) Define Learning curve. [WBUT 2019]

Answer:

Refer to Question No. 1(a) of Long Answer Type Questions.

b) Five years ago, when the relevant cost index was 120, a nuclear centrifuge cost \$40,000. The centrifuge had a capacity of separating 1500 gallons of ionized solution per hour. Today, it is desired to build a centrifuge with capacity of 4500 gallons per hour, but the cost index now is 300. Assuming a power-sizing exponent to reflect economies of scale, x, of 0.75, use the power-sizing model to determine the approximate cost (expressed in today's dollars) of the new reactor. [WBUT 2019]

POPULAR PUBLICATIONS

Answer:

Cost of new reactor today

Cost of old centrifuge five years ago

$$= \left(\frac{\text{Capacity of new}}{\text{Capacity of old}} \right)^{\text{power-sizing exponent}} \times \left(\frac{\text{Cost index today}}{\text{Cost index 5 years ago}} \right)$$

$$\Rightarrow \frac{\text{Cost of New}}{40,000} = \left(\frac{4,500}{1,500} \right)^{0.75} \times \left(\frac{120}{100} \right)$$

$$\Rightarrow \text{Cost of new reactor today} = 40,000 (3)^{0.75} \times 1.20 = 109416.34$$

8. Write short notes on the following:

a) Power sizing model of cost estimation

[WBUT 2012, 2017]

b) Life cycle costing

[WBUT 2012, 2014, 2017, 2019]

c) Sunk cost and variable cost

[WBUT 2015]

d) Segmenting Model

[WBUT 2016]

e) Use of price indexes in engineering economic analysis

[WBUT 2018]

f) Opportunity costs

[WBUT 2019]

Answer:

a) Power sizing model of cost estimation

This model expresses that cost of producing / manufacturing any product will increase in different proportion as the units are increased. This is practically an effect of economy of scale. The model "scales up" or "scales down" known costs, thereby accounting for economies of scale that are common in industrial plant and equipment costs. Consider the cost to build a Factory. Would it cost twice as much to build the same facility with double the capacity? It is unlikely. The power-sizing model uses the exponent (x), called the power-sizing exponent, to reflect economies of scale in the size or capacity.

Cost of economic comparable production cost depends on an exponential factor termed as **Power Sizing Exponent**: To estimate the cost of B based on the cost of comparable item A, use the equation.

$$\text{Cost of B/Cost of A} = [\text{Size(capacity) of B}/\text{Size(capacity) of A}]^x$$

Where x is the power-sizing exponent, costs of A and B are at the same point in time (same rupee basis), and size or capacity is in the same physical units for both A and B. The power-sizing exponent (x) can be 1.0 (indicating a linear cost-versus-size/capacity relationship) or greater than 1.0 (indicating diseconomies of scale), but it is usually less than 1.0 (indicating economies of scale). Generally the ratio should be less than 2, and it should never exceed 5. This model works best in a "middle" sized asset not for very small or very large size.

b) Life cycle costing

Life cycle costing applies mixture of managerial, engineering and financial practices to physical assets to achieve the economic life cycle cost of the physical assets. Its objective

is to use the physical assets in such an efficient way so that it results in lowest cost during the life span of the assets. Therefore, life cycle costing seeks to achieve a trade off between higher capital cost and lower running and maintenance cost.

In life cycle costing, just-in-time philosophy is used to reduce the maintenance cost by applying the inventory control on a JIT basis to avail the necessary spares as and when maintenance departments wants and exactly in the same quantity as wanted which leads to elimination of the need to keep spares inventory which reduces the maintenance cost. JIT philosophy is also applied in life cycle costing to eliminate waste resulting from manufacturing process and hence the application of life cycle costing reduces the machine down time over its life and its setup cost.

c) Sunk cost and variable cost:

Sunk Cost is the cost which is already being incurred in past and is not relevant to any decision making process. e.g., any survey or market research cost to decide whether any job to be undertaken or not is a sunk cost. Here the cost is not relevant to the decision whether to start the job or not as it is already being incurred and not depended / relevant to the decision. Thus sunk cost is which cannot be recovered.

Variable Costs are those items of costs which change with changes in the level of output in the short run i.e. they increase or decrease with the rise or fall of the output e.g. wages of labour, prices of raw materials, fuel, power etc.

The distinction between fixed and variable costs is **valid in the short run** because the distinction originates from the distinction between the fixed and variable factors which is only valid in the short period while in the long run all inputs being variable, all costs are also variable costs. The distinction is of the degree not in kind.

d) Segmenting Model

Here partitions the total estimation task into segments. Each segment is estimated, and then the segment estimates are combined for the total cost estimate. Like if cost for any student fest to be calculated first it is segmented into the category of decoration, artiste cost, entertainment and food, travelling, advertisement etc. cost of each segment is calculated and then added to derive the total cost.

e) Use of price indexes in engineering economic analysis:

Engineering economic analysis is concerned with making estimates of future events: the outcomes of yearly costs and benefits, interest rates, salvage values; and tax rates are all examples of such estimates. Associated with these estimates are varying degrees of uncertainty. The challenge for the engineering economist is to reduce this uncertainty for each estimate. Historical data provide a snapshot of how the quantities of interest have behaved in the past. Knowing this past (historical) behavior should provide insight on how to estimate. Their behavior in the future, as well as to reduce the uncertainty of that estimate. This is where the data that price indexes provide come into play. Although it is very dangerous to extrapolate past data into the future in the short run, price index data can be useful in making estimates (especially when considered from a long-term perspective). In this way the engineering economist can use average historical percentage

POPULAR PUBLICATIONS

increases (or decreases) from commodity-specific and composite indexes, along with data from market analyse and other sources, to estimate how economic quantities may behave in the future. One may wonder how both commodity-specific and composite price indexes may be used in engineering economic analyses. The answer to that question is reasonably straightforward. As we have established, price indexes can be useful in making estimates of future outcomes. The following principle applies to commodity-specific and composite price indexes and such estimates: When the estimated quantities are items that are tracked by commodity specific indexes, then those indexes should be used to calculate average historical percentage increases (or decreases). If no commodity-specific indexes are kept, one should use an appropriate composite index to make this calculation. For example, to estimate electric usage costs for a turret lathe over a 5-year period, one would first want to refer to a commodity-specific index that tracks this quantity. If such an index does not exist, one might use a specific index for a very closely related commodity—perhaps, in this case, an index of electric usage costs of screw lathes. In the absence of such substitute or related commodity indexes, one could use appropriate composite indexes: there may be a composite index that tracks electric usage costs for industrial metal-cutting machinery. Or, as before, a related composite index could be used. The key point is that one should try to identify and use a price index that most closely relates to the quantity being estimated in the analysis.

f) Opportunity costs:

Opportunity costs represent the benefits an individual, investor or business *misses out on* when choosing one alternative over another. While financial reports do not show opportunity cost, business owners can use it to make educated decisions when they have multiple options before them. Bottlenecks are often a cause of opportunity costs.

Because by definition they are unseen, opportunity costs can be easily overlooked if one is not careful. Understanding the potential missed opportunities foregone by choosing one investment over another allows for better decision-making.

The formula for calculating an opportunity cost is simply the difference between the expected returns of each option. Say that you have option A, to invest in the stock market hoping to generate capital gain returns. Option B is to reinvest your money back into the business, expecting that newer equipment will increase production efficiency, leading to lower operational expenses and a higher profit margin.

CASH FLOW, INTEREST AND EQUIVALENCE

Multiple Choice Type Questions

1. A person if deposits Rs. 50,000 in a bank at an interest of 10% compounded annually, then the future value at the end of 5 years will be [WBUT 2016]
 a) 80,525 b) 70,525 c) 85,525 d) 90,525

Answer: (a)

2. A deposit of Rs. 1,10,000 was made for 31 days. The net interest after deducting 20% withholding tax is Rs. 890.36. Find the rate of return annually. [WBUT 2016]
 a) 12.25 b) 12.75 c) 11.75 d) 11.95

Answer: (d)

3. The present value of ₹ 1 to be received after 3 years compounded annually at 10% [WBUT 2018]
 a) 0.909 b) 0.826 c) 0.751 d) None of these

Answer: (c)

4. A uniform series of payment occurring at equal interval of time is called _____. [WBUT 2018]
 a) Annuity b) Amortization c) Depreciation d) Bond

Answer: (a)

Short Answer Type Questions

1. A company wants to set up a reserve which will help it to have an annual amount equivalent to Rs. 1,00,000 for every year for the next 20 years towards its employees welfare measure. Find the single payment that has to be made now. [Given $i = 15\%$]. [WBUT 2012]

Answer:

The company sets up a reserve which will result in a annuity of Rs. 1,00,000 per year for 20 years. The single payment to be made at present should be equal to the present worth of Rs. 1,00,000 per annum for 20 years which can be calculated as follows:

Amount of single payment

$$\begin{aligned} &= 1,00,000 \times PVIFA_{(15\%, 20\text{yr})} \\ &= 1,00,000 \times 6.259 = 6,25,900 \text{ Rs.} \end{aligned}$$

2. A person has invested Rs. 10,000 in a bank at an interest of 10% p.a. How much amount will receive after 2 years if the compounding is done: [WBUT 2013]

- a) Annually
- b) Semi Annually
- c) Quarterly

POPULAR PUBLICATIONS

- d) Monthly
e) Daily.

Answer:

$$FV_n = PV \left(1 + \frac{r}{m}\right)^{mn}$$

where, FV_n = Future value after n years

n = number of years

m = number of times compounding is done in a year.

(a) $FV = PV \left(1 + \frac{0.10}{1}\right)^{1 \times 2} = 10,000 (1 + 0.10)^2 = 10,000 \times (1.10)^2 = 12,100 \text{ Rs.}$

(b) $FV = 10,000 \left(1 + \frac{0.10}{2}\right)^{2 \times 2} = 10,000 (1 + 0.05)^4 = 10,000 \times (1.05)^4 = 10,000 \times 1.216 = 12,160 \text{ Rs.}$

(c) $FV = 10,000 \left(1 + \frac{0.10}{4}\right)^{4 \times 2} = 10,000 (1.025)^8 = 10,000 \times 1.219 = 12,190 \text{ Rs.}$

(d) $FV = 10,000 \left(1 + \frac{0.10}{12}\right)^{12 \times 2} = 10,000 (1.00833)^{24} = 12,204 \text{ Rs.}$

(e) $FV = 10,000 \left(1 + \frac{0.10}{365}\right)^{365 \times 2} = 12,214 \text{ Rs.}$

3. A student took an education loan on 2013 of Rs. 7 Lakhs @ 9% p.a. for 5 years. Calculate amount of money to be repaid after 5 years under

a) Compound interest (compound annually)

b) Find out the effective interest rate. [WBUT 2014]

Answer:

a) Compounded annually

FW after 5 years = $7 \times FVPF_{(9\%, 5y)}$

$$= 7 \times 1.539 = 8.155 \text{ lakhs}$$

Therefore, the student has to repay Rs. 8.155 lakhs after 5 years.

b) Effective interest rate = $r\%$ (let) p.a

$$\therefore 7(1 + 5r) = 8.155 \Rightarrow 1 + 5r = 1.539$$

$$\Rightarrow 5r = 0.539$$

$$\Rightarrow r = 0.1078 = 10.78\%$$

∴ Effective simple interest rate p.a. = 10.78% (Ans.)

4. An automobile company recently advertised its car for a down-payment of Rs. 1,50,000. Alternatively the car can be taken home by the customer without any immediate down-payment but he has to pay an equal yearly amount of Rs. 25,000 for 15 years at an interest rate of 18% compounded annually. Suggest the better option to the customer. [WBUT 2014]

Answer:

Annualized equivalent worth of down payment

$$= 1,50,000 \times \text{capital recovery factor}$$

$$= 1,50,000 \times \frac{1}{PVIFA_{(18\%, 15y)}} = \frac{1,50,000}{5.092} = 29,457.97 \text{ Rs.} > 25,000 \text{ Rs.}$$

Since the AEW of down payment is greater than equal yearly installment, therefore the better option for the customer is to purchase the car by paying an equal yearly amount of Rs. 25,000 for 15 years.

5. Define time value of money. Discuss its importance.

[WBUT 2016]

Answer:

It is known to all that Rs. 100 on hand now is more valuable than Rs. 100 receivable after one year. Differently speaking, we will not part with Rs. 100 now in return for a firm assurance that the same sum will be repaid after a year. But we might part with Rs. 100 now if we are assured that something more than Rs. 100 will be paid at the end of the first year. This extra compensation required for parting with Rs. 100 now is called 'interest' or the time value of money.

Money has time value for the following reasons:

- Money can be employed productively in order to generate real returns. e.g., if Rs. 100 is invested in material and labour produces finished goods worth Rs. 105, we can say that the investment of Rs. 100 has earned a return of Rs. 5 per cent.
- During inflation, value of a rupee today is more (higher purchasing power) than a rupee in future.
- As because future is uncertain, people like current consumption more than future consumption.

Companies need to take new projects for the purpose of expansion, diversification or modernization. A project involves investing a sum of money now, in anticipation of benefits spread over a period of time in the future. Whether a project is financially viable or not can be determined by adding the benefits occurring over the future period and by comparing the total value of the benefits with the initial investment. If the aggregate value of benefits exceeds the initial investment, the project is considered to be financially viable. Apparently this approach seems to be satisfactory, but we should be aware of the fact that behind this approach there is the assumption of considering value of money remains the same. In other words, we have assumed that: value of one rupee now = value

POPULAR PUBLICATIONS

of one rupee at the end of year 1 = value of one rupee at the end of year 2 and so on. But this assumption is incorrect because money has time value.

6. If Rs. 100 is invested at a compound interest @ 10% p.a. for 3 years, what will be the respective future value for consecutive 3 years? [WBUT 2017]

Answer:

We know, $FV_n = PV(1+r)^n$

Here $n = 1, 2, 3$ years respectively

FV_n = Future value at end of n th year

r = compound interest rate per annum

Future value after 1 year = $FV_1 = 100(1+0.10)^1 = 110$ Rs.

Future value after 2 years = $FV_2 = 100(1.10)^2 = 121$ Rs.

Future value after 3 years = $FV_3 = 100(1.10)^3 = 133.10$ Rs.

7. A student has taken a loan of Rs. 3,00,000 for 3 years at 9% per annum. Calculate how much needs to be repaid at the end of 3 years under compound interest rate. [WBUT 2019]

Answer:

The student needs to repay at the end of three years under compound interest rate the following amount:

$$3,00,000 \times FVIF(9\%, 3) = 3,00,000 \times 1.295 = 3,88,500 \text{ Rs.}$$

Long Answer Type Questions

1. Write short notes on the following:

a) Debt repayment

[WBUT 2012, 2017]

b) Effective interest rate and nominal interest rate

[WBUT 2013]

Answer:

a) Debt repayment:

Debt repayment can be also called loan amortization. Although the manner in which the debt is repaid, i.e., repayment schedule depends on the terms of agreement between lender and debtor but generally there are two common methods of loan repayment – (1) periodic payment which normally includes interest in a lump sum. Most loans are repaid in equal periodic installments which can be normally, quarterly or annually covering interest as well as principal known as amortized. The amount of each installment of repayment of amortized loan can be calculated as –

Loan amount

PVIFA (no. of years of maturity, interest rate)

b) Effective interest rate and nominal interest rate:

The Nominal Interest Rate (also known as an Annualised Percentage Rate or APR) nominal interest rate is this: it's the interest rate before inflation gets added into the mix. It's also the one you're most likely to be exposed to as it's the interest rate lenders commonly quote in loan and deposit agreements. Nominal interest is directly affected by the rate of inflation and can make a big dent in an investor's purchasing power.

Effective Interest Rates correct for this by "converting" nominal rates into annual compound interest.

Confusingly, in the context of inflation, 'nominal' has a different meaning. A nominal rate can mean a rate before adjusting for inflation, and a real rate is a constant-prices rate. To avoid confusion about the term nominal which has these different meanings, some finance textbooks use the term 'Annualised Percentage Rate' or APR rather than 'nominal rate' when they are discussing the difference between effective rates and APR's.

The effective interest rate is always calculated as if compounded annually. The effective rate is calculated in the following way, where r is the effective rate, i the nominal rate and n the number of compounding periods per year.

$$r = (1 + i/n)^n - 1$$

For example, if you have a nominal rate of 10% per annum, compounded monthly, the effective rate would be:

$$r = (1 + 0.10/12)^{12} - 1 = 0.104713 \text{ or } 10.47\%$$

So, the effective rate is higher than the nominal rate because the interest is being added to the principal more frequently.

If you have a nominal rate of 10% per annum, compounded quarterly, the effective rate would be:

$$r = (1 + 0.10/4)^4 - 1 = 0.103813 \text{ or } 10.38\%$$

So, the effective rate is lower than the nominal rate because the interest is being added to the principal less frequently.

If you have a nominal rate of 10% per annum, compounded daily, the effective rate would be:

$$r = (1 + 0.10/365)^{365} - 1 = 0.10517 \text{ or } 10.517\%$$

So, the effective rate is higher than the nominal rate because the interest is being added to the principal more frequently.

If you have a nominal rate of 10% per annum, compounded continuously, the effective rate would be:

$$r = e^{0.10} - 1 = 1.10517 \text{ or } 10.517\%$$

So, the effective rate is higher than the nominal rate because the interest is being added to the principal infinitely frequently.

So, the effective rate is always higher than the nominal rate, provided that the nominal rate is positive and the compounding frequency is greater than once per year.

It's important to note that the effective rate is not the same as the APR. The APR is the nominal rate plus fees and other costs associated with the loan.

For example, if you have a nominal rate of 10% per annum, compounded monthly, and there are fees of \$100 per month, the APR would be:

$$\text{APR} = \left(\frac{1}{12} \times 10\% \right) + \frac{100}{12} = 10.517\%$$

So, the APR is higher than the nominal rate because the fees are being added to the principal more frequently.

It's also important to note that the effective rate is not the same as the real rate. The real rate is the nominal rate minus the inflation rate.

CASH FLOW & RATE OF RETURN ANALYSIS

Multiple Choice Type Questions

1. At the break-even point

- a) revenue > cost
- b) revenue < cost
- c) revenue = cost
- d) no relation between revenue and cost

Answer: (c)

[WBUT 2013]

2. For a project to be financially viable the value of Benefit-Cost Ratio should be

- a) greater than 1
- b) less than 1
- c) in between 0 and 1
- d) negative

Answer: (a)

[WBUT 2013]

3. The period required for the project's profit or other benefits to equal the project's cost is called

- a) investment period
- b) pay back period

- c) equalization period
- d) none of these

Answer: (c)

[WBUT 2013]

4. Internal rate of return is an indicator of

- a) loss of an investment
- b) profit of an investment
- c) efficiency of an investment

- d) depreciation of an asset

Answer: (c)

[WBUT 2013]

5. Annualized capital recovery cost is defined as

- a) $C(A/P, i, n) + S(A/F, i, n)$
- b) $-C(A/P, i, n) + S(A/F, i, n)$
- c) $-C(A/P, i, n) - S(A/F, i, n)$

- d) $C(A/P, i, n) - S(A/F, i, n)$

Answer: (d)

[WBUT 2015]

6. IRR stands for the rate of return for which

- a) $NPV = 0$
- b) $NPV = 1$

- c) $NPV = -1$
- d) NPV is maximum

Answer: (a)

[WBUT 2018]

7. At Break-even point

- a) Total revenue = Total Cost
- c) Total revenue = Total Variable Cost

Answer: (a)

[WBUT 2018, 2019]

- b) Total revenue = Total Fixed Cost
- d) All of these

Short Answer Type Questions

1. Discuss in detail the concept of Sensitivity Analysis. [WBUT 2012]

OR,

What is sensitivity Analysis? Discuss the merits and demerits of sensitivity analysis. [WBUT 2014]

OR,

State the concept of Sensitivity Analysis. [WBUT 2017]

Answer:

Sensitivity analysis:

Costs include variable costs which depend on the sales volume. The NPV or IRR of the project is again determined by analysing the after-tax cash flows. We can understand that it is difficult to arrive at an unbiased and accurate forecast of each variable. If forecasts go wrong, the reliability of NPV or IRR is lost. Therefore each item of forecast is changed, one at a time, to at least three values – pessimistic, expected and optimistic. NPV is re-calculated for all the three assumptions.. This method of re-calculating NPV or IRR for each forecast is called sensitivity analysis.

Advantages:

1. It is a very popular method of assessing risk because it shows how robust or vulnerable a project is to changes in values of underlying variables.
2. It indicates whether further work is necessary because if NPV is highly sensitive to changes in some factor, it may be worthwhile to explore how the variability of the critical factor may be reduced.
3. It is intuitively very appealing because it articulates the concerns the project evaluators normally have.

Disadvantages:

1. It does not provide any idea of the probability of the change in the variable – only shows what happens to NPV if there is a change in that variable.
2. In the real world many variables change together whereas in sensitivity analysis only one variable is changed at a time.
3. The results of sensitivity analysis may be interpreted by different decision-makers differently – one may accept the project – another may reject.

2. Assuming that the cost structure and selling price remain same in 2014 and 2015, find out

- i) P/V ratio;
- ii) Break Even point of sales;
- iii) Profit when sales are of Rs. 3,00,000;
- iv) Sales required to earn a profit of Rs. 60,000 and
- v) Margin of safety in 2015

[WBUT 2015]

Period	Sales (Rs.)	Profit (Rs.)
2014	3,60,000	27,000
2015	4,20,000	39,000

POPULAR PUBLICATIONS

Answer:

$$\text{i) } \frac{P}{V} \text{ ratio} = \frac{\text{change in profit}}{\text{change in sales}} = \frac{39,000 - 27,000}{4,20,000 - 3,60,000} = \frac{12,000}{60,000} = \frac{1}{5} = 0.20 = 20\% \text{ (Ans.)}$$

$$\text{ii) Break-even-point sales} = \frac{\text{Fixed cost}}{p/v \text{ ratio}}$$

Now, variable cost to sales ratio

$$= 1 - \frac{P}{V} \text{ ratio} = 1 - 0.20 = 0.80 = 80\%$$

∴ Variable cost in 2015 = Sales in 2015 × 0.80 = 4,20,000 × 0.80 = 3,36,000 Rs.

$$\begin{aligned}\therefore \text{Fixed cost} &= \text{Total cost in 2015} - \text{variable cost in 2015} \\ &= (\text{Sales in 2015} - \text{profit in 2015}) - \text{variable cost in 2015} \\ &= (4,20,000 - 39,000) - 3,36,000 \\ &= 3,81,000 - 3,36,000 = 45,000 \text{ Rs.}\end{aligned}$$

$$\therefore \text{Break-even point sales} = \frac{45,000}{0.20} = 2,25,000 \text{ Rs.}$$

$$\therefore \text{Now, sales} = \frac{\text{Fixed cost} + \text{Profit}}{p/v \text{ ratio}}$$

$$\therefore 3,00,000 = \frac{45,000 + \text{Profit}}{0.20}$$

$$\text{iii) } \Rightarrow \text{Profit} = (3,00,000 \times 0.20) - 45,000$$

$$= 60,000 - 45,000 = 15,000 \text{ Rs. (Ans.)}$$

$$\text{iv) Again, Sales} = \frac{\text{Fixed cost} + \text{Profit}}{p/v \text{ ratio}}$$

$$= \frac{45,000 + 60,000}{0.20} = \frac{1,05,000}{0.20} = 5,25,000 \text{ Rs. (Ans.)}$$

v) Margin of safety in 2015

$$= \text{Actual sales in 2015} - \text{Break-even sales}$$

$$= 4,20,000 - 2,25,000 = 1,95,000 \text{ Rs.}$$

3. Define IRR (Internal Rate of Return).

Answer:

Internal rate of return is a percentage discount rate used in capital investment appraisals which makes the present value of the cost of the projects equal to the future cash flows of the project. It is the rate of return which equates the present value of anticipated net cash flows with the initial outlay. The IRR is also defined as the rate at which the net present value is zero. The test of profitability of a project is the relationship between the internal

[WBUT 2015]

rate of return (%) of the project and the minimum acceptable rate of return. The IRR can be determined by solving the following equation for r which is discount rate.

$$C_0 = \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \dots + \frac{C_n}{(1+r)^n}$$

4. a) What is the significance of Profit-Volume ratio? [WBUT 2015]
 b) Calculate price of a product from the following information:

Profit Volume ratio is 30%

Variable cost of the product is Rs. 140/-

Answer:

a) Profit-volume ratio: It represents the ratio of contribution to sales and called as p/v ratio. It has a property fundamental that p/v ratio remains constant at various levels of activity provided there is no change in either selling price (per unit) or variable cost (per unit).

p/v ratio can be increased by reducing variable cost, or by increasing selling price or by increasing overall p/v ratio of the sales mix.

Under normal or ordinary circumstances, different products are to be ranked in descending order of p/v ratios in determination of optimum-product-mix to generate maximum profit when there is no particular constraint on production or sale. Therefore, under normal or ordinary circumstances, Profit-Volume ratio is the measure of efficiency of a product.

b) Given, p/v ratio = 30% = 0.30

Variable cost = 140 Rs.

Now, variable cost to Sale Price Ratio = $1 - p/v$ ratio = $1 - 0.30 = 0.70$

$$\therefore \text{Sale Price} = \text{Variable cost} \times \frac{1}{0.70} = 140 \times \frac{100}{70} = 200 \text{ Rs. (Ans.)}$$

5. Explain the concept of 'Break-even' analysis. [WBUT 2015]

Answer:

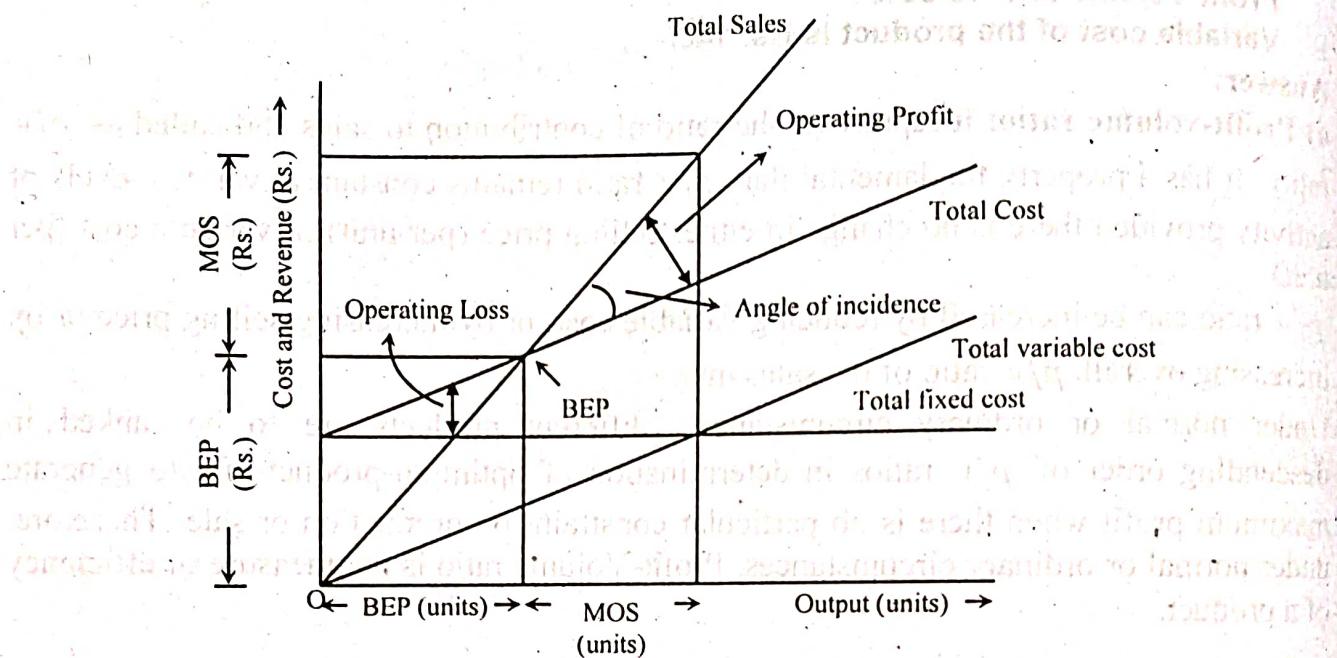
Break-even-analysis involves the method of presenting to management the effect of changes in volumes on profits by indicating at what level the total cost and total revenue will be in equilibrium, i.e., by indicating the Break-even Point. It is one form of application of Cost-Volume-Profit Analysis which is an useful tool in the hands of management by applying which the management ascertains the impact on profit when one or more of the various factors which affect profit such as selling price (per unit), volume of sales, Total Fixed Cost, Variable Cost (per unit), combinations in which the various product lines are sold etc. changes. Break-even analysis is a technique of having a preview of profit prospects and a tool of profit-planning by integrating the cost and revenue estimates to ascertain the profits and losses associated with different levels of output.

6. Define Break-even point. Represent the elements diagrammatically and derive the BEP and BEP sales algebraically. [WBUT 2016]

Answer:

Break-even Analysis: Refer to Question No. 5 of Short Answer Type Questions.

Break-even-Point is that volume of production and sales where there is no profit or no loss, i.e., where Total Revenue and Total Cost lines intersect.



$$\text{Since, } p/v \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}}$$

$$\therefore \text{Sales} = \frac{\text{Contribution}}{p/v \text{ ratio}} = \frac{\text{Fixed cost} + \text{Profit}}{p/v \text{ ratio}}$$

at BEP, since profit = nil, so that

$$\text{Break-even sales (Rs.)} = \frac{\text{Fixed Cost}}{p/v \text{ ratio}}$$

$$\text{Break-even sales (in units)} = \frac{\text{B.E. Sales (Rs.)}}{\text{Unit Sale Price}} = \frac{\text{Fixed Cost}}{\frac{p}{v} \text{ ratio}} \times \frac{1}{\text{S.P.(Pu)}}$$

$$= \frac{\text{Fixed Cost}}{\text{Contribution}} \times \frac{1}{\text{S.P.(Pu)}} = \frac{\text{Fixed cost} \times \text{S.P.(Pu)} \times \text{Units}}{\text{Contribution} \times \text{S.P.(Pu)}}$$

$$= \frac{\text{Fixed Cost}}{\text{Contribution}} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

7. A machine needed for 3 years can be purchased for Rs. 77,662 and sold at the end of period for about Rs. 25,000. A comparable machine can be leased for Rs. 30,000 per year. If a firm expects return of 20% on investments, should it buy or lease the machine? Capital recovery factor (20%, 3 years) = 0.4747. Sinking fund factor (20%, 3 years = 0.2747). [WBUT 2019]

Answer:

Annualised equivalent cost of purchase option:

$$= 77,662 \times \text{Capital recovery factor}(20\%, 3 \text{ years})$$

$$- 25,000 \times \text{Sinking fund factor}(20\%, 3 \text{ years})$$

$$= (77,662 \times 0.4747) - (25,000 \times 0.2747) = 36,866 - 6,868 = 29,998 \text{ Rs.}$$

Annualised equivalent cost of lease option 30,000 Rs.
Therefore, the firm should lease the machine be its annualised equivalent cost is less than the option of purchasing the machine.

Long Answer Type Questions

1. a) What is NPV? What are its limitations? What are the differences between NPV and IRR?

b) What are the two ways of defining benefit-cost ratio?

c) The expected cash flows of a project are as follows:

Year	Cash flow
0	-100,000
1	20,000
2	30,000
3	40,000
4	50,000
5	30,000

The cost of capital is 12%. Calculate the following:

i) Net present value

ii) benefit-cost ratio

iii) Internal rate of return.

[WBUT 2012]

Answer:

a) 1st Part:

Net Present Value (NPV) Method

In this method all cash flows attributable to a capital investment projects are discounted by a chosen percentage e.g. the firms weighted average cost of capital to obtain the present value of the future cash flows. If the present value of the future cash flows is higher than the present value of the investments the proposal is accepted else rejected. In order to arrive at the net present value the present value of the future cash flows is deducted from the initial investment.

$$NPV = \frac{C_1}{(1+K)} + \frac{C_2}{(1+K)^2} + \frac{C_3}{(1+K)^3} + \dots + \frac{C_n}{(1+K)^n} - C_0$$

POPULAR PUBLICATIONS

$$\text{i.e., } NPV = \sum_{t=1}^n \frac{C_t}{(1+K)^t} - C_0$$

where C_0 = initial investment (cash out flows)

C_t = cash inflows occurring at time t

K = Discount rate.

2nd Part:

Limitations of NPV Method

- It is difficult to calculate as well as to understand.
- Calculating the discount rate is complicated.
- This method is an absolute measure. When two projects are considered this method will favour the project with the higher NPV.
- If two projects with different life spans are evaluated using this method, this method may not yield satisfactory result.

3rd Part:

Difference between NPV and IRR

1. Under the net present value method the cash flows are converted into present values by using discount rates which is usually taken to be the firm's cost of capital. Under the IRR method no such discount rate is given and it is to be selected such that the PV of capital outlay exactly equals the PV of net cash flows.
2. NPV tries to maximize the benefit from the project in terms of PV which is in line with the corporate objective, i.e. maximization of value of firm whereas IRR denotes the interest rate at which the investment in the original cost of the asset is recovered during the life span of the asset.
3. NPV is based on more logical assumption to reinvestment than of IRR whose principal shortcoming is the assumption that the firm has opportunity to reinvest a project's released funds at IRR, whereas NPV assumes that the opportunity to reinvest at cost of capital.

b) A benefit-cost ratio (BCR) is an indicator, used in the formal discipline of cost-benefit analysis, which attempts to summarize the overall value for money of a project or proposal. A BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs should be expressed in discounted present values.

Benefit cost ratio (BCR) takes into account the amount of monetary gain realized by performing a project versus the amount it costs to execute the project. The higher the BCR the better would be the investment. General rule of thumb is that if the benefit is higher than the cost the project is a good investment.

The two ways of defining benefit-cost-ratio are:

- 1) NPV which determines the net benefit i.e., Benefit minus cost of project in absolute term because

Net Present Value = Present value of cash inflows – Present value of cash outflows

2) Profitability index which determines the net benefit from the project in relative terms, in terms of a ratio, i.e., PI measures the benefit per rupees of investment in the project

and given by $PI = \frac{\text{Present value of cash inflows}}{\text{Present value of cash outflows}}$

c) (i)

(1) Year	(2) Cash Flow	(3) PVIF @12%	(4) = (2) × (3) PV of cash flow
00	(1,00,000)	1.000	(1,00,000)
01	20,000	0.893	17,860
02	30,000	0.797	23,910
03	40,000	0.712	28,480
04	50,000	0.636	31,800
05	30,000	0.567	17,010
(i) Net Present Value =			(+) 19,060

$$\text{(ii) Benefit-cost ratio} = \frac{\text{PV of cash inflows}}{\text{PV of cash outflows}} = \frac{1,19,060}{1,00,000} = 1.20 \text{ (approx.)}$$

(iii) Calculation of NPV @14%

$$\begin{aligned}
 &= (20,000 \times 0.877) + (30,000 \times 0.769) + (40,000 \times 0.675) \\
 &\quad + (50,000 \times 0.592) + (30,000 \times 0.519) - 1,00,000 \\
 &= 17,540 + 23,070 + 27,000 + 29,600 + 15,570 - 1,00,000 \\
 &= 12,780
 \end{aligned}$$

Calculation of NPV @16%

$$\begin{aligned}
 &= (20,000 \times 0.862) + (30,000 \times 0.743) + (40,000 \times 0.641) \\
 &\quad + (50,000 \times 0.552) + (30,000 \times 0.476) - 1,00,000
 \end{aligned}$$

$$\begin{aligned}
 &= 17,240 + 22,290 + 25,640 + 27,600 + 14,280 - 1,00,000 \\
 &= 1,07,050 - 1,00,000 = 7,050
 \end{aligned}$$

Calculation of NPV @20%

$$\begin{aligned}
 &= (20,000 \times 0.833) + (30,000 \times 0.694) + (40,000 \times 0.579) \\
 &\quad + (50,000 \times 0.482) + (30,000 \times 0.402) - 1,00,000 \\
 &= 16,660 + 20,820 + 23,160 + 24,100 + 12,060 - 1,00,000 \\
 &= (-) 3,200
 \end{aligned}$$

Discount rate NPV

IRR	16%	(+)	7,050
	20%	(–)	3,200

POPULAR PUBLICATIONS

Therefore, applying interpolation, we get,

$$\Rightarrow \frac{IRR - 16}{20 - 16} = \frac{0 - 7,050}{-3,200 - 7,050}$$

$$\Rightarrow \frac{IRR - 16}{4} = \frac{-7,050}{-10,250} = 0.688$$

$$\Rightarrow IRR - 16 = 2.751$$

$$\Rightarrow IRR = 18.751\% (\text{approx.})$$

2. a) What do you mean by NPV? Why do you consider this to be so important?

[WBUT 2014]

Answer:

1st Part: Refer to Question No. 1(1st Part) of Long Answer Type Questions.

2nd Part:

If the present value of the future cash flows is higher than the present value of the investment i.e., NPV is positive, then the proposal is accepted else rejected. In order to arrive at the net present value the present value of the future cash flows is deducted from the initial investment. Therefore NPV is a critical decision-making criteria.

b) In a project being considered, the initial outlay is Rs. 30,000; useful life of the project is 10 years; net cash inflow per annum is Rs. 8,00,000; rate of interest is 20%. The salvage value of the plant at the end of 10 years is Rs. 12,00,000. Is the project commercially possible? [WBUT 2014]

Answer:

1. PV of initial outlay = 30,000

$$2. \text{PV of Net cash inflow} = 8,00,000 \times PVIFA_{(20\%, 10y)} \\ = 8,00,000 \times 4.193 = 33,54,400 \text{ Rs.}$$

$$3. \text{PV of salvage value} = 12,00,000 \times PVIF_{(20\%, 10y)} \\ = 12,00,000 \times 0.162 = 1,94,400 \text{ Rs.}$$

$$\text{Therefore } NPV = (2) + (3) - (1)$$

$$= 33,54,400 + 1,94,400 - 30,000 = 31,90,000 \text{ Rs.}$$

Since NPV is highly positive, therefore the project is very much possible and profitable commercially.

3. Explain the importance of Ratio Analysis and Capital budgeting methods in an organization? [WBUT 2017]

Answer:

1st part:

A ratio is an arithmetical relationship between two figures. Financial ratio analysis is a study of ratios between various items or groups of items in financial statements. Financial ratios can be classified into five broad categories – (1) Liquidity ratios, (2) Leverage ratios, (3) Turnover ratios, (4) Profitability ratios, and (5) Valuation ratios.

Liquidity ratios measure the capacity of a firm to meet its short term obligations. Leverage ratios signify the ability of the concern to meet long-term obligations. Turnover ratios measure how efficiently assets are employed by a firm. Profitability ratios signify the profit-earning capacity of business whereas valuation ratios indicate how the equity-stock of the company is assessed in the capital market.

Some important ratios are:

a) Current ratio = $\frac{\text{current assets}}{\text{current liabilities}}$, should be ideally 2:1 higher than which indicates existence of idle funds and lesser than which indicates danger of hampering of normal day-to-day operations.

b) Inventory turnover = $\frac{\text{Cost of goods sold}}{\text{Average inventory}}$, high ratio indicates expansion of business with dangers of overtrading and stock-out whereas low ratio indicates accumulation of slow-moving, non-moving or obsolete stock resulting from inefficient inventory management.

c) 1st Part: Return on capital employed = $\frac{\text{Profit before interest and tax}}{\text{Capital employed}}$

It signified overall efficiency of concern.

2nd part:

Importance of capital budgeting

Capital expenditure involves long term commitment of resources to realize future profits. Therefore capital expenditure reflects basic company objectives and has a long-term and significant effect on the well being of the firm. Effective planning and controlling of such expenditure are particularly important for following reasons:

1. **Time Period:** Capital budgeting decisions has got long term implication because its effect extends into many years in future which may involve unforeseen situations.
2. **Risk:** Capital budgeting decisions change the risk complexion of the firm because the average benefits of the firm increases as a result of investment which causes frequent fluctuations in earnings making more risky situation.
3. **Amount:** Capital investment decision involves large amount of funds blocked through life time of project. In most cases supply of capital is not abundant because firm has scarce capital resources – therefore, capital investment decisions must reduce the risk from point of supply of capital as far as possible ensuring the following:
 - a) **Regular return:** From the project equal to/higher than its cost.
 - b) **Recovery of capital:** Invested during life span of project.
 - c) **Best possible results:** Of such investment
4. **Reversibility:** Once a capital budgeting decision taken, they are not easily reversible within short term period because there may neither be any market for such second hand capital goods nor there be any possibility of conversion of such capital assets

POPULAR PUBLICATIONS

into other usable assets – the remedy being disposal of the same sustaining heavy capital losses.

5. **Decision:** Penalties for any wrong capital budgeting decision is very severe, further there may be heavy loss due to obsolescence of fixed assets due to technology changes.
6. **Others:** Capital budgeting decisions provide the structure that supports the operating activities of the firm and also has effect upon Break-even point, Total supply, Total profit etc.

4. The following details are on the cash flows of two projects A and B:

Year	Project A cash flows (Rs.)	Project B cash flows (Rs.)
0	4,00,000	5,00,000
1	2,00,000	1,00,000
2	1,75,000	2,00,000
3	3,25,000	3,00,000
4	2,00,000	4,00,000
5	1,50,000	2,00,000

Compute **PBP**, **NPV** and **PI** for A and B and suggest which project should be accepted and why? [WBUT 2017]

Answer:

Calculation of payback period

Yr.	Project A		Project B	
	Cash flows (Rs.)	Commulative Cash flows (Rs.)	Cash flows (Rs.)	Commulative Cash flows (Rs.)
01	2,00,000	2,00,000	1,00,000	1,00,000
02	1,75,000	3,75,000	2,00,000	3,00,000
03	3,25,000	7,00,000	3,00,000	6,00,000

$$\text{PBP of Project A} = \frac{4,00,000 - 3,75,000}{3,25,000} + 2 = 2.077 \text{ years (Ans.)}$$

$$\text{PBP of Project B} = \frac{5,00,000 - 3,00,000}{3,00,000} + 2 = 2.667 \text{ years (Ans.)}$$

5. A firm whose cost of capital is 10%, considering two mutually exclusive projects X and Y, the details are as follows:

Year	Project A	Project B
0	(70,000)	(7,00,000)
1	10,000	50,000
2	20,000	40,000
3	30,000	20,000
4	45,000	10,000
5	60,000	10,000
Total Cash Flow	1,65,000	1,30,000

Compute NPV, Profitability Index and IRR of the two projects.

[WBUT 2019]

Answer:

	PVIF@10%	Project A		Project B	
		Cash Flow	PV of Cash Flow	Cash	PV of Cash Flow
(1)	(2)	(3)	(4) = (2) × (3)	(5)	(6) = (2) × (5)
00	1.005	(70,000)	(70,000)	(70,000)	(70,000)
01	0.909	10,000	9,090	50,000	45,450
02	0.826	20,000	16,520	40,000	33,040
03	0.751	30,000	22,530	20,000	15,020
04	0.683	45,000	30,735	10,000	6,830
05	0.621	60,000	37,260	10,000	6,210
Net Present Value		46,135			(5,93,450)

$$\text{Profitability Index of Project} = \frac{\text{PV of cash inflows}}{\text{PV of cash outflows}}$$

$$\text{For Project A} = \frac{9,090 + 16,520 + 22,530 + 30,735 + 37,260}{70,000} = \frac{1,16,135}{70,000} = 1.659$$

$$\text{For Project B} = \frac{45,450 + 33,040 + 15,020 + 6,830 + 6,210}{7,00,000} = \frac{1,06,550}{7,00,000} = 0.152$$

2nd Part:

Let us calculate NPV of Project A @ 20%

Year	PVIF @ 20%	Cash Flow	PV of Cash Flow
(1)	(2)	(3)	(4) = (2) × (3)
00	1.000	(70,000)	(70,000)
01	0.833	10,000	8,330
02	0.694	20,000	13,880
03	0.579	30,000	17,370
04	0.482	45,000	21,690
05	0.402	60,000	24,120
Net Present Value			15,390

Discount rate
NPV We apply extrapolation

$$10\% \quad 46,135$$

$$20\% \quad 15,390$$

$$\text{IRR} \quad \text{NIL}$$

$$\frac{\text{IRR} - 10}{20 - 10} = \frac{0 - 46,135}{15,390 - 46,135}$$

$$\Rightarrow \text{IRR} = \frac{10 \times (-46,135)}{-30,745} + 10 = 25.006\%$$

So, IRR of Project A 25.006%

3rd Part:

Let us calculate NPV of Project B @ 1%

Year	Cash Flow	PVIF @ 1%	PV of Cash Flow
00	(7,00,000)	1.000	(7,00,000)
01	50,000	0.990	49,500
02	40,000	0.980	39,200
03	20,000	0.971	19,420
04	10,000	0.961	9,610
05	10,000	0.951	9,510
Net Present Value			(-) 5,72,760

Since even at 1% discount rate the NPV of Project B comes highly negatives so IRR should be negative, a negative return on investment occurs.

6. Write short notes on the following:

- a) Profitability Index Method (PI) / Benefit cost ratio [WBUT 2014, 2018]
- b) Relevance of Capital budgeting [WBUT 2015]
- c) Sensitivity analysis [WBUT 2015]
- d) NPV vs. IRR. [WBUT 2016, 2018]
- e) Average Rate of Return (ARR) [WBUT 2017]
- f) Importance of Break Even analysis [WBUT 2018]
- g) Break-even Analysis [WBUT 2019]

Answer:

a) Profitability Index Method (PI):

Another time adjusted method of evaluating the investment proposals is the Benefit Cost (B/C) ratio or Profitability Index (PI). Profitability Index is the ratio of the present value of cash inflows at the required rate of return, to the initial cash outflow of the investment. The formula for calculating benefit cost ratio or profitability index is as follows:

$$PI = PV \text{ of cash flows} / \text{Initial cash outlay} = PV(C) / O$$

b) Relevance of Capital budgeting:

Capital budgeting is the process of identifying and selecting investments in the long lived assets or the assets which are expected to produce benefits over a period of more than a year. Business is all about exploring avenues for growth and innovation, which requires continuous evaluation of possible investment opportunities. Capital expenditure involves long term commitment of resources to realize future profits. Therefore capital expenditure reflects basic company objectives and has a long-term and significant effect on the well being of the firm. Effective planning and controlling of such expenditure are particularly important for following reasons:

1. **Time Period:** Capital budgeting decisions has got long term implication because its effect extends into many years in future which may involve unforeseen situations.
2. **Risk:** Capital budgeting decisions change the risk complexion of the firm because the average benefits of the firm increases as a result of investment which causes frequent fluctuations in earnings making more risky situation.

3. **Amount:** Capital investment decision involves large amount of funds blocked through life time of project. In most cases supply of capital is not abundant because firm has scarce capital resources – therefore, capital investment decisions must reduce the risk from point of supply of capital as far as possible ensuring the following:
 - a) **Regular return:** From the project equal to/higher than its cost.
 - b) **Recovery of capital:** Invested during life span of project.
 - c) **Best possible results:** Of such investment
4. **Reversibility:** Once a capital budgeting decision taken, they are not easily reversible within short term period because there may neither be any market for such second hand capital goods nor there be any possibility of conversion of such capital assets into other usable assets – the remedy being disposal of the same sustaining heavy capital losses.

c) **Sensitivity analysis:** *Refer to Question No. 1 of Short Answer Type Questions.*

d) **NPV vs. IRR:**

Refer to Question No. 1(a) (3rd Part) of Long Answer Type Questions.

e) **Average Rate of Return (ARR):**

$$\text{Average rate of return} = \frac{\text{Average annual profit after taxes}}{\text{Average invest during the life of project}} \times 100$$

Alternatively,

$$= \frac{\text{Average annual cash flows after taxes}}{\text{Average interest}} \times 100$$

The concept of average investment is used because it is very sound and conceptually more logical.

Average investment may be

(a) Original cost of the project i.e. original investment

or,

(b) Average investment = Net working capital + Salvage value + $\frac{1}{2} (\text{Original value} - \text{S/Value})$

Average investment = Half the depreciable part

+ whole of non-depreciable part of cost of investment.

Because, assuming straight line method of depreciation in which case book-value of asset declines at a constant rate from its purchase price to zero at end of its depreciable life – but if the machine has salvage value then the depreciable cost is divided by two as the salvage value is recovered only at the end of the life of project and therefore an amount equal to salvage value remains tied up in the project throughout its life-time.

If an additional Net Working Capital is required in initial years of project life which is likely to be released only at end of project life then we also consider such net Working Capital in average investment computation.

POPULAR PUBLICATIONS

Evaluation of ARR Method

The ARR method may claim some merits

Simplicity:

The ARR method is simple to understand and use. It does not involve complicated computations.

f) Importance of Break Even analysis:

Some of the importance of break-even analysis are listed as follows:

Determines the Number of Units to be Sold: The calculation of break-even analysis is done so that the owner knows the number of units to be sold in order to break-even i.e. no profit and no loss. The selling price of each product, the variable cost of each product, and the total fixed costs are required to determine the break-even analysis.

Helps in Budgeting and Setting Targets: Since you know at which point you can break-even, you accordingly can set budgets. Also, break-even analysis can be used in setting realistic targets for the business. This is possible because you know at which point a business is able to achieve profits and hence, you can use this break-even point to set benchmarks or targets for your firm. If you are not well-versed in analyzing your finances, then hire a financial controller who will help you make a budget and set realistic targets for your firm.

Determine the Margin of Safety: The margin of safety can be calculated by subtracting the current level of sales less the break-even point and then dividing it by the selling price per unit. In the event of a recession or an economic downturn, sales tend to decline. So, with the help of the break-even analysis, you can determine the minimum level of sales required to ensure you make profits. By knowing the margin of safety for a particular product or service, managers can make better business decisions.

Cost Control and Monitoring: Since managers know that the fixed and the variable costs affect the profitability of the business, they can see the effect of the changes to costs with the help of break-even analysis. It helps them to determine the extent of changes in costs affects the profitability and the break-even point.

g) Break-even Analysis:

Refer to Question No. 5 of Short Answer Type Questions.

INFLATION AND PRICE CHANGE

Multiple Choice Type Questions

1. Inflation makes

[WBUT 2012, 2017]

- a) Future rupees less valuable than present rupees
- b) Future rupees more valuable than present rupees
- c) Future rupees equal to present rupees
- d) None of these

Answer: (a)

2. Which one of the following is helpful for measuring inflation? [WBUT 2012, 2017]

- a) Learning curve
- b) Segmentation model
- c) Consumer price index
- d) MARR (Minimum attractive rate of return)

Answer: (c)

3. If the inflation rate is 6% per year and the market interest rate is known to be 15% per year. What is the implied real interest rate in this inflationary economy?

[WBUT 2012, 2016, 2017]

- a) 11.45%
- b) 9.00%
- c) 8.49%
- d) 8%

Answer: (c)

4. What is inflation?

[WBUT 2013]

- a) it is the term used to describe a decline in purchasing power evidenced in an economic environment of rising prices
- b) it is the term used to describe a incline in purchasing power evidenced in an economic environment of rising prices
- c) it is the term used to describe an increase in purchasing power evidenced in an economic environment of rising prices
- d) it is the term used to describe a reversal in purchasing power evidenced in an economic environment of rising prices

Answer: (a)

5. The index which measures prices of a selection of goods and services purchased by a given consumer class is

[WBUT 2014]

- a) Consumer Price Index
- b) Commodity Price Indices
- c) Composite Price Indices
- d) Producer Price Indices

Answer: (a)

6. If Index Number for a certain period is equal to 100, then

[WBUT 2016]

- a) Price are increasing
- b) Prices are decreasing
- c) Prices remain constant
- d) Change in prices cannot be predicted

POPULAR PUBLICATIONS

Answer: (c)

7. Demand-pull inflation may be caused by

[WBUT 2018]

- a) An increase in costs
- b) A reduction in government spending
- c) A reduction in interest rates
- d) An outward shift in aggregate supply

Answer: (c)

8. If the inflation rate is 7% per year, market interest rate is 15%, then the real interest rate will be

[WBUT 2019]

- a) 7%
- b) 10%
- c) 3%
- d) 12%

Answer: (a)

9. Which one of the following is involved to measure inflation

[WBUT 2019]

- a) Nominal Interest Rate
- b) MARR
- c) Consumer Price Index
- d) None of these

Answer: (c)

Short Answer Type Questions

1. Give the causes of inflation and its controlling measures.

[WBUT 2014]

Answer:

1st Part:

The main causes of inflation are as follows:

- Inflation occurs when the aggregate demand for products exceeds the aggregate supply of products. Prices usually increase when aggregate demand is higher than aggregate supply. Put in other words, factors such as increase in money supply, the government budget deficit, increase in export earnings, etc. create new demand, and if supply does not match this increased demand, demand-pull inflation arises. In this type of inflation, the unemployment level is at a minimal level. Such inflation is called **Demand-pull inflation**.
- Inflation may also occur due to increase in the cost of factors of production. The increase in the cost of factors of production results in a decrease in the supply of products by producers in the economy, or it makes producers push up the prices of their products to cover their higher costs of production. In cost-push inflation, the unemployment level may be high if high costs reduce production and thus, employment of factors of production including labor. Such inflation is called **Cost-push inflation**.

2nd Part:

Measures to Control Inflation: The measures to control inflation can be classified into monetary, fiscal and other measures.

Monetary measures: Monetary policy is framed by the central bank of a country. The central bank is required to regulate the money supply in the economy in order to control

the rate of inflation. Quantitative and qualitative measures are used to control the money supply. Quantitative credit control measures are in the form of bank rate policy, open market operations and variable reserve ratio, which influences the cost and availability of credit in an economy. The cash reserve ratio is the most significant monetary control measure and a high cash reserve ratio requirement reduces the capacity of the banks to lend. Qualitative or the selective control measures include the regulation of consumer credit, directives, moral persuasion, publicity, etc. to control monetary expansion in the economy

Fiscal measures: Some of the fiscal measures to control inflation are public expenditure, taxation and public borrowing.

Public expenditure: A decrease in the public expenditure by the government can control the inflation rate. The public expenditure should not be reduced in productive areas, but should be cut in the non-productive areas.

Taxation: The amount of disposable income depends on the taxation policy of the government. The imposition of direct or indirect taxes reduces the purchasing power of the people. Anti-inflationary taxation should reduce that part of the disposable income which would otherwise have been spent on consumption.

Public borrowing: During inflationary periods, government can start special saving programs to take away the extra purchasing power which would otherwise increase pressure on demand. Similarly, government can offer bonds to public at attractive interest coupon rates

Other measures

Price control and rationing: Price control is a situation where the government fixes an upper limit on the prices of goods and services. Rationing helps in distribution of essential goods evenly among the people.

Wage policy: The government can undertake certain steps like restriction of additional benefits offered to employees, their salaries, etc.

2. Discuss the causes of inflation.

[WBUT 2016]

Answer:

Refer to Question No. 1(1st Part) of Short Answer Type Questions.

3. Distinguish between Consumer Price Index (CPI) and Wholesale Price Index (WPI).

[WBUT 2019]

Answer:

- 1) The wholesale price index measures the variations in the price levels of commodities that flow through the wholesale trade intermediaries. Consumer Price Index is measured on the basis of the changes in retail prices of selected goods and services on which a particular income group of consumers spend their money
- 2) The WPI helps policy makers in policy formulation and economic analysis.
The consumer price index indicates the cost of living of a particular group in the population.

POPULAR PUBLICATIONS

- 3) The Office of the Economic Adviser (OEA) in the Ministry of Industry is responsible for compiling the wholesale price index. The weights assigned to the items included in the commodity basket of WPI series are based on their volume in wholesale transactions in the economy. The WPI is drawn up at frequent intervals, and therefore continuous monitoring of the price level is possible. The non-commodity producing sector i.e. services and non-tradable commodities are not covered in the WPI. There are several consumer price indices and each index measures the retail prices of goods consumed by different segments as the consumption patterns of different groups vary. Each commodity is given a different weightage. The consumption basket data is collected from family budget surveys and the price data are obtained from retail outlets.

4. Define inflation. What are the causes of inflation?

[WBUT 2019]

Answer:

Inflation may be defined as a general rise in the prices in a persistent manner. It causes a loss in the purchasing power of a currency. It happens when many prices increase simultaneously. Inflation causes money to lose purchasing power. What a rupee hundred can buy today will be less in coming days. Thus the rupee hundred loses the purchasing power due to the price rise, that is inflation.

Causes of inflation:

Refer to Question No. 1(1st Part) of Short Answer Type Questions.

Long Answer Type Questions

1. a) Discuss about creeping inflation, walking inflation, galloping inflation and running inflation.
b) Distinguish between (i) open and repressed inflation (ii) comprehensive and sporadic inflation.
c) Define inflationary gap.

[WBUT 2014]

Answer:

a) Creeping Inflation: When prices are gently rising, it is referred as Creeping Inflation. It is the mildest form of inflation and also known as a Mild Inflation or Low Inflation. According to R.P. Kent, when prices rise by not more than (i.e. Up to) 3% per annum (year), it is called Creeping Inflation.

Walking Inflation: When the rate of rising prices is more than the Creeping Inflation, it is known as Walking Inflation. Trotting Inflation is its another name. When prices rise by more than 3%, but less than 10% per annum (i.e., between 3%, and 10% per annum), it is called as Walking Inflation. According to some economists, we must take Walking Inflation seriously as it gives a cautionary signal for the occurrence of Running inflation. Furthermore, if, not checked in due time, it can eventually result in Galloping Inflation.

Galloping Inflation: According to Prof. Samuelson, if prices rise by dual or triple digit inflation rates like 30% or 400% or 999% yearly, then the situation can be termed as Galloping Inflation. When prices rise by more than 20%, but less than 1000% per annum

(i.e., between 20% to 1000% per annum), Galloping Inflation occurs. Jumping Inflation is its another name. India has been witnessing it from second five-year plan period.

Running Inflation: A rapid acceleration in the rate of rising prices is called Running Inflation. It occurs when prices rise by more than 10% in a year. Though economists have not suggested a fixed range for measuring running inflation, we may consider a price increase between 10% to 20% per annum (double-digit inflation rate) as a Running Inflation.

b) (i) **Open Inflation:** When government does not attempt to restrict inflation, it is known as an Open Inflation. In a free-market economy, where prices are allowed to take its course, Open Inflation occurs.

Repressed Inflation: When government prevents the price rise through price controls, rationing, etc., it is known as Suppressed Inflation. Repressed Inflation is its another name. However, when government removes its controls, it becomes Open Inflation. It then leads to corruption, black marketing, artificial scarcity,

(ii) **Comprehensive Inflation:** When the prices of all commodities rise in the entire economy, it is known as Comprehensive Inflation. Economy-Wide Inflation is its another name.

Sporadic Inflation: Time when prices of only a few commodities in some regions (areas) rise, it is called Sporadic Inflation. It is sectional in nature. For example, increase in food prices due to bad monsoon (winds that bring seasonal rains in India).

c) An **inflationary gap**, in economics, is the amount by which the actual gross domestic product exceeds potential full-employment GDP. It is one type of output gap, the other being a recessionary gap.

The inflationary gap is always an ex-ante phenomenon, it is always expected to occur in the future. It arises when expected expenditure will not equal expected consumption at a future date. Keynes defines it as the excess demand in the market for consumption of goods and services. He defined an inflationary gap as an excess of planned expenditure over the available output at pre-inflation or base prices. Given a constant average propensity to save, rising money incomes at full employment level would lead to an excess of demand over supply and to a consequent inflationary gap. Thus Keynes used the concept of the inflationary gap to show the main determinants that cause an inflationary rise of prices.

When an initial increase in aggregate demand produces inflation (so called demand-pull inflation) and real GDP increase, the price level and real GDP are determined at the point where the new aggregate demand and the short-run aggregate supply meet. This point is known as **above full-employment equilibrium**, since the short-run aggregate supply is above the long-term aggregate supply, i.e. above the aggregate supply at full employment. The gap created between real GDP and potential GDP is the consequence of inflation, this is one of the reasons this type of gap is called an inflationary gap.

Obviously, this situation cannot last forever, because there is a shortage of labour. The shortage of labour produces the rise of wage rates, which makes the short-run aggregate supply decrease, until it reaches the full-employment level. The short-run aggregate

POPULAR PUBLICATIONS

supply decrease makes an upward pressure on the price level, consequently causing inflation. The once created gap between real GDP and potential GDP was the sign of forthcoming inflation, this is another reason this type gap is called an inflationary gap. The main cause of the gap is considered to be expansionary monetary policies carried out by the government. An inflationary gap is a signal that the economy is in the boom part of the trade cycle, resources are being used over their capacity, factories are operating with increasing average costs; wage rates increase because labour is used beyond normal hours at overtime pay rates. A case of the gap can arise when consumer or investor spending is very buoyant, when foreign demand is increasing or when government expenditure increases.

- 2. a) What are the causes of inflation?**
- b) A company is planning to start an employee welfare fund. It needs Rs. 50,00,000 during the first year and it increases by Rs. 5,00,000 every year thereafter up to the end of the 5th year. The above figures are in terms of today's rupee value. The annual average rate of inflation is 6% for the next five years. The interest rate is 18%, compounded annually. Find the single deposit which will provide the required series of fund towards employee's welfare scheme after taking the inflation rate into account.**

[WBUT 2018]

Answer:

a) Refer to Question No. 1(1st Part) of Short Answer Type Questions.

b) Fund requirement during the first year = Rs. 50,00,000

Annual increase in the fund requirement = Rs. 5,00,000

Annual inflation rate = 6%

Interest rate = 18%, compounded annually

The computation of the present worth of the annual fund requirements is summarized in Table below:

Table: Computation of the Present Worth of the Annual Requirements

End of year (n)	Annual fund requirements (Rs.)	Inflation factor (F/P, 6%, n)	Inflated annual fund requirements (Rs.)	P/F, 18%, n	Present worth of inflated annual fund requirements (Rs.)
A	B	C	D	E	F
B × C					D × E
1	50,00,000	1.060	53,00,000	0.8475	44,91,750
2	55,00,000	1.124	61,82,000	0.7182	44,39,912
3	60,00,000	1.191	71,46,000	0.6086	43,49,056
4	65,00,000	1.262	82,03,000	0.5158	42,31,107
5	70,00,000	1.338	93,66,000	0.4371	40,93,879
Rs. 2,16,05,704					

The value of the single deposit to be made now to receive the specified series for the next five years is Rs. 2,16,05,704

3. Write short notes on the following:

- a) Minimum cost life of a new asset [WBUT 2012]
- b) Importance of index numbers [WBUT 2013]
- c) Cost push and demand pull inflation [WBUT 2013, 2016]
- d) Causes and effects of inflation [WBUT 2015]
- e) Types of inflation [WBUT 2018]

Answer:

a) Minimum cost life of a new asset

The minimum cost life of any new asset is the years at which the EUAC is minimized. This cost life should be lesser than the actual / physical life of an asset, due to the increase of operating & maintenance cost in the later years of asset.

Before analyzing the minimum cost life for any new asset, following points are to be considered.

- a) Generally cost of operation & maintenance of a machine increases due to passage of time.
- b) The replacing machine [defender] time should be fixed.
- c) Replacement policy for gradual deterioration
- d) Salvage value to be determined prior to the decision making.
- e) Time value of replacing asset.

As discussed the replacement decision would be at which the EUAC is minimum. This calculation can be made in two aspects.

$$\text{EUAC} = \text{Price of equipment} - \text{value of machine after life}$$

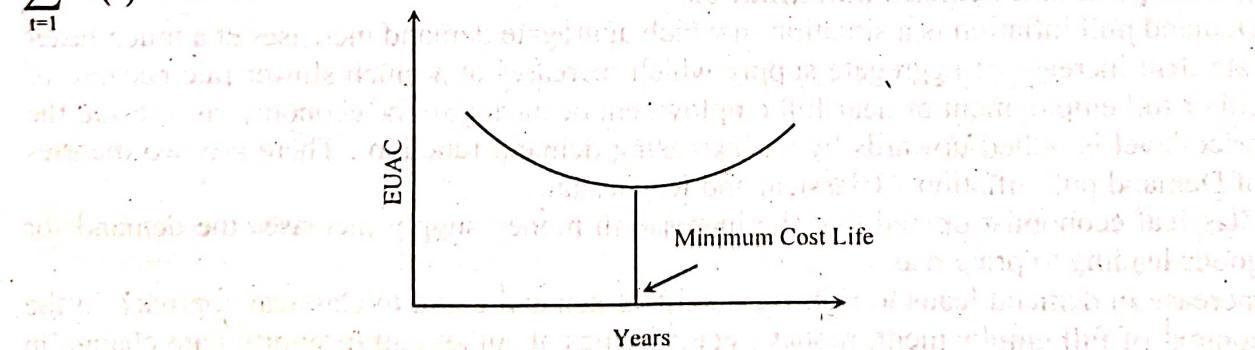
$$[\text{i.e., salvage value}] + \text{Maintenance cost for the years.}$$

The process:

$$\text{TC} = (\text{C} - \text{SV}) + \sum_{t=1}^n M(t) \text{ and Average TC}[EUAC] = \left[\text{C} - \text{SV} + \sum_{t=1}^n M(t)/n \right]$$

Here, C = Cost of the machine, S.V.= Salvage value and

$$\sum_{t=1}^n M(t) = \text{cumulative maintenance cost.}$$



POPULAR PUBLICATIONS

The Life Cycle Cost can be explained by a curve which indicates the total operating cost for the asset (value on the Life Cycle Cost axis) as well as the economic life of the new asset (corresponding value on the Year of Intervention axis) at each possible replacement interval. The Life Cycle cost for a new asset at each replacement timing is calculated by taking the sum of the annualized capital costs and the annualized risk costs.

b) Importance of index numbers

Index numbers are the numerical figures which indicate the relative position in respect of price, or quantity or value of a group of articles at certain periods of time as compared with another period – called base period. When compared with price it is called Price Index Number, when with quantity- quantity Index number with value – value index number. Index number for the base period is 100. Index number for the other year is the current period. Index numbers possess much practical importance in measuring changes in the cost of living, production trends, trade, income variations, etc.

Benefits of index number and its uses:

Index numbers are used –

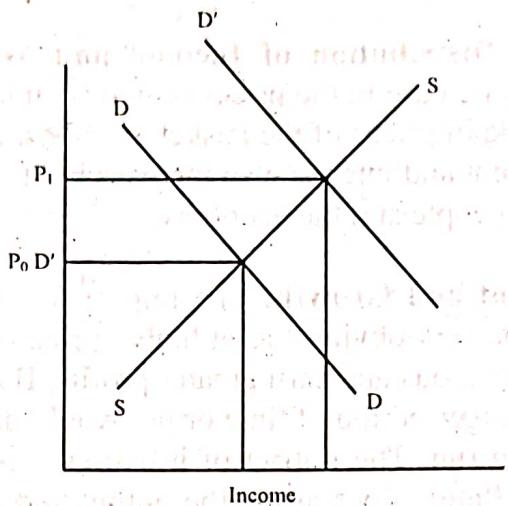
- a) in determining the purchasing power of money
- b) in Measuring Changes in the Value of Money
- c) in the calculation of dearness allowance payable to employees.
- d) in deflating. i.e., in the process of finding real values like real wages, real income, real sales
- e) in studying seasonal variations
- f) in measuring the Cost of Living
- g) in measuring changes in Industrial Production
- h) in analysing markets for goods and services
- i) Index numbers are useful in the formulation of economic and business policies.
- j) Index numbers reveal trends and tendencies.
- k) in forecasting future economic activity and in prediction.
- l) in determining the Foreign Exchange Rates

c) Cost push and demand pull inflation

Demand pull inflation is a situation in which aggregate demand increases at a much faster rate than increase of aggregate supply which increases at a much slower rate because of either full employment or near full employment occurring in the economy, as a result, the price-level is pulled upwards by an increasing demand function . There are two theories of Demand pull inflation – Classical and Keynesian.

Classical economist opined that the increase in money supply increases the demand for goods leading to price rise.

Increase in demand leads to rightward shift of demand curve in classical approach in the context of full employment, money supply brings about an equi-proportionate change in price level (Index).



It is shown that with the rise in income the demand curve (DD) shifts to the right (DD') resulting to rise in the price level (index) from P_0 to P_1 .

Keynesian theory explains that there is no relation between the money supply and the rise in price level and the aggregate demand may rise due to rise in consumer demand or investment demand or government expenditure or export demand or combination of these four. At a given level of full employment such increase in aggregate demand leads to an upward pressure in price, such situation is the demand pull inflation.

Inflation may be due to the rise in overall increase in cost of production leading to price rise, known as Cost Push Inflation. Cost of production increases due to increase in cost of raw materials, wages and other cost factors of production leading price rises and thus cost push inflation. Prices may also rise due to increase in profit margin (known as profit push inflation).

Therefore, cost push = wage push + profit push

Wage push arises due to strong trade unions putting pressure upon management causing increase in wages which in labour intensive production system causes increase in cost of production resultantly decreasing supply when demand is constant so that supply curve shifts leftwards causing price level to rise. Profit push factor arises due to rising cost of production reducing profit-motive of producers who in turn shift their burden of higher cost on consumers by increasing the sales prices of goods and services produced by them causing inflation.

d) Causes and effects of inflation:

Causes: Refer to Question No. 1(1st Part) of Short Answer Type Questions.

Effects of inflation:

Economic impacts of inflation: There is a growing concern about inflation the world over as it has wide ranging implications for the entire global economic system. It also has an impact on the balance of payments of a country. Generally, it leads to worsening of balance of payments position. Inflation results in redistribution of income and hence, wealth the various sections of the society and affects output.

Effect of Inflation on the Distribution of Income and Wealth: As stated above inflation refers to a persistent increase in the prices of goods and services over a period of time. If along with the increase in prices of the basket of goods, the returns of the various factor inputs such as wages, rent and interest also increase by the same amount then there will not be any impact on the people and the economy.

Effect of Inflation on Output and Growth: The impact of inflation on production of goods and services seems to be very obvious, as at higher prices it is always profitable for the producers to produce more goods and earn greater profits. But whether the changes in output would continue for a longer period of time or not would depend on whether we are dealing with short run or long run. The impact of inflation is not the same in short run and long run. In short run, inflation does affect the output and in the long run there are many factors, which would decide whether the output would increase, or decrease.

e) Types of inflation:

Refer to Question No. 1(a) & (b) of Long Answer Type Questions.

PRESENT WORTH ANALYSIS

Multiple Choice Type Questions

1. Contribution margin is the

- a) excess of sale price over variable costs
- b) excess of sale price over fixed costs
- c) excess of sale price over both variable and fixed costs
- d) none of these

Answer: (a)

[WBUT 2015, 2019]

2. What is the full form of PVIF?

- a) Present Value Income Factor
- b) Present Value Interest Factor
- c) Profit Value Income factor

- b) Present Value Interest Factor
- d) None of these

Answer: (b)

[WBUT 2015]

3. If actual sales are Rs. 40,000 and BEP sales are Rs. 30,000, the Margin of Safety is Rs.

- a) 70,000
- b) 10,000
- c) 1,40,000
- d) 15,000

Answer: (b)

[WBUT 2015]

4. $FVIF_{5\%,3} =$

- a) 1.050
- b) 1.103

- c) 1.158

[WBUT 2015]

- d) 1.216

Answer: (c)

5. In NPV method, cash flow is generally calculated on the basis of

[MODEL QUESTION]

- a) present value
- b) future value
- c) annuity

- d) none of these

Answer: (a)

6. What could be the value of present sum for Rs. 10,000 at 8% interest for one year?

[MODEL QUESTION]

- a) Rs. 9,263
- b) Rs. 9,261
- c) Rs. 9,264

- d) none of these

Answer: (d)

Short Choice Type Questions

1. a) Define Break – even point. Represent the elements diagrammatically, and derive the BEP and BEP sales algebraically.

b) The following data relates to ABC Co. for 2011:

Fixed Factory Overhead = Rs. 30,000

Fixed Selling Overheads = Rs. 6,000

Variable Manufacturing Cost per unit = Rs. 6.00

Variable Selling Cost per unit = Rs. 1.50

Selling Price Per unit = Rs. 12.00

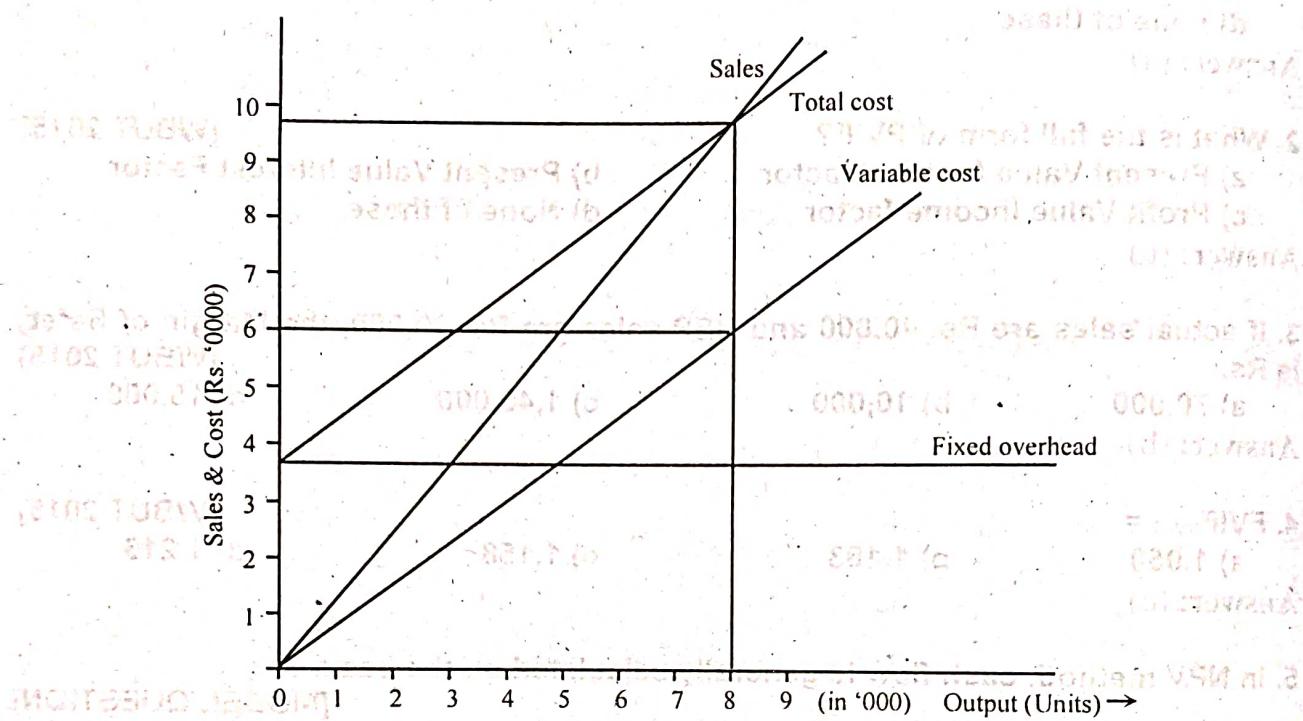
Calculate

i) Break-even point in terms of units and BE sales in terms of rupees.

ii) Number of units that need to be sold to make a profit of Rs. 45,000. [WBUT 2012]

Answer:

a) Break-even-point is that level of sales at which total cost and total revenue will be in equilibrium, i.e., it is that level of sales at which there is neither profit nor loss. If actual sales exceed Break-even-sales, then, there is profit but if actual sales are less than break-even-level of sales, then, there is loss.



$$\begin{aligned}
 \text{b) i) } \text{BEP}(\text{units}) &= \frac{\text{Fixed cost}}{\text{Contribution (per unit)}} \\
 &= \frac{\text{Fixed Factory Overhead} + \text{Fixed selling overhead}}{\text{Selling price (per unit)} - \text{Variable cost per unit}} \\
 &= \frac{30,000 + 6,000}{12 - (6 + 1.50)} = \frac{36,000}{12 - 7.50} = \frac{36,000}{4.50} = 8,000 \text{ units}
 \end{aligned}$$

$$\begin{aligned}
 \text{BEP(Rs.)} &= \frac{\text{Fixed cost}}{\text{p/v ratio}} = \frac{\text{Fixed cost}}{\frac{\text{Contribution (per unit)}}{\text{Selling price (per unit)}}} \\
 &= \frac{36,000}{\frac{4.50}{12}} = \frac{36,000 \times 12}{4.50} = 96,000 \text{ Rs.}
 \end{aligned}$$

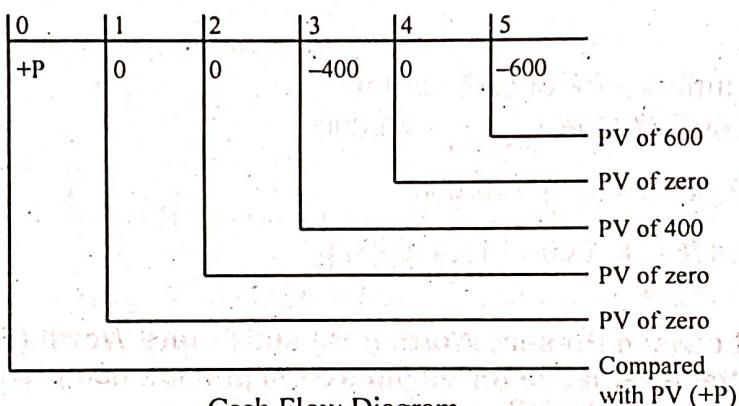
ii) No. of units needed to be sold to make profit of Rs. 45,000

$$= \frac{\text{Target profit} + \text{Fixed cost}}{\text{Contribution (per unit)}} \\ = \frac{45,000 + 36,000}{4.50} = \frac{81,000}{4.50} = 18,000 \text{ units.}$$

2. For the following cash flow situation shown in Table 3.4, draw the cash flow diagram and solve for P assuming a 12% interest rate. [WBUT 2012]

Year	Cash Flow (L.E)
0	+P
1	0
2	0
3	-400
4	0
5	-600

Answer:



$$\begin{aligned} P &= 600 \times PVIF(12\%, 5y) + 400 \times PVIF(12\%, 3y) \\ &= (600 \times 0.567) + (400 \times 0.712) = 340.20 + 284.80 = 625 \text{ Rs.} \end{aligned}$$

3. Find the better choice by using Future Worth [Given $i = 12\%$]

[WBUT 2012]

Machine	Initial Cost	Return/Year	Life
A	40 Lakhs	8 Lakhs	4 Years
B	45 Lakhs	10 Lakhs	4 Years

Answer:

Calculation of Future Worth of machine A

$$\begin{aligned} \text{FW of initial cost} &= 40,00,000 \times FVIF(12\%, 4\text{yr}) \\ &= 40,00,000 \times 1.574 = (62,96,000) \\ \text{FW of initial cost} &= 40,00,000 \times FVIFA(12\%, 4\text{yr}) \\ &= 40,00,000 \times 1.574 = (62,96,000) \\ \text{NFW of machine A} &= (24,72,000) \end{aligned}$$

Calculation of FW of machine B

$$\begin{aligned} \text{FW of initial cost} &= 45,00,000 \times \text{FVIF}_{(12\%, 4\text{yr})} \\ &= 45,00,000 \times 1.574 \\ &= (70,83,000) \end{aligned}$$

$$\begin{aligned} \text{FW of initial cost} &= 10,00,000 \times \text{FVIFA}_{(12\%, 4\text{yr})} \\ &= 10,00,000 \times 4.779 \\ &= (47,79,000) \\ \text{NFW of machine A} &= (23,04,000) \end{aligned}$$

Here, the Net future worth of both the machines are negative so that investment in both would result in losses so that none should be invested but if one of them has to be chosen then machine B is better because its net future worth is less than that of machine A.

N.B.: To solve the above problem, we have assumed that returns per year are given in terms of cash inflows.

4. Calculate the net present value of a project requiring an initial investment of Rs. 40,000 and which provides a net cash flow of Rs. 12,000 each year for 6 years. Assume the cost funds to 8% p.a. and there is no scrap value.

(The present value of an annuity of Re. 1 for 6 years at 8% p.a. interest is 4.623).

[WBUT 2013]

Answer:

$$\begin{aligned} NPV &= PV \text{ of cash inflow} - PV \text{ of cash outflow} \\ &= 12,000 \times PVDA_{(8\%, 6 \text{ yrs})} - 40,000 \\ &= (12,000 \times 4.623) - 40,000 \\ &= 55,476 - 40,000 = 15,476 \text{ Rs.} \end{aligned}$$

5. a) Distinguish between Present Worth (PW) and Future Worth (FW).

b) Choose the better alternative for the metro rail project, use present Worth (PW), rate of interest = 6%

Option A: Stage I costing Rs. 30 crores now and stage II 25 years later at Rs 35 crores.

Option B: Both stages together now costing Rs. 40 crores

[WBUT 2014]

Answer:

a) The future value (FV) measures the nominal future sum of money that a given sum of money is "worth" at a specified time in the future assuming a certain interest rate, or more generally, rate of return. The FV is calculated by multiplying the present value by the accumulation function. The value does not include corrections for inflation or other factors that affect the true value of money in the future. The process of finding the FV is often called capitalization.

On the other hand, the present value (PV) is the value on a given date of a payment or series of payments made at other times. The process of finding the PV from the FV is called discounting.

PV and FV are related, which reflects compounding interest (simple interest has n multiplied by i , instead of as the exponent). Since it's really rare to use simple interest, this formula is the important one.

$$FV = PV(1+i)^n$$

FV of a single payment

The PV and FV are directly related.

PV and FV vary directly: when one increases, the other increases, assuming that the interest rate and number of periods remain constant.

The interest rate (or discount rate) and the number of periods are the two other **variables** that affect the FV and PV, the higher the interest rate, the lower the PV and the higher the FV. The same relationships apply for the number of periods. The more time that passes, or the more interest accrued per period, the higher the FV will be if the PV is constant, and vice versa.

The formula implicitly assumes that there is only a single payment. If there are multiple payments, the PV is the sum of the present values of each payment and the FV is the sum of the future values of each payment.

$$\begin{aligned} \text{b) PW of option A} &= 30 + \left\{ 35 \times PVFA_{(6\%, 25y)} \right\} \\ &= 30 + (35 \times 0.233) = 30 + 8.155 \\ &= \boxed{38.155 \text{ crores}} \end{aligned}$$

$$\text{PW of option B} = \boxed{40 \text{ crores}}$$

Therefore choose option B having higher PW than option A.

6. What is the present value of the following cash flow, assuming a discount rate of 8%? [WBUT 2015]

Year	Cash flow
1	30000
2	20000
3	10000
4	10000

Answer:

Calculation of present value

Year (1)	Cash Flow (Rs.) (2)	PVIF @8% (3)	Present value (Rs.) (4)=(2)×(3)
01	30,000	0.926	27,780
02	20,000	0.857	17,140
03	10,000	0.794	7,940
04	10,000	0.735	7,350
Present value of cash flow			60,210

Long Answer Type Questions

1. a) Life of a dam is 50 years. Initial Cost = Rs. 25,000, $i=10\%$, Find E(PW)

Profit (Rs)	5000	8000	10000
Probability	0.3	0.6	0.1

Life (Yrs)	6	9
Probability	0.67	0.33

b) $i=5\%$. What should be the optimum height of the dam?

Height (Mts)	Prob.(Flood)	Initial Cost	Damage/year (if flood)
0	0.25	0	800,000
20	0.05	700,000	500,000
30	0.01	800,000	300,000
40	0.002	900,000	200,000

[WBUT 2014]

Answer:

a) Expected value of profit = \sum probability \times Profit
 $= (0.3 \times 5,000) + (0.6 \times 8,000) + (0.1 \times 10,000)$
 $= 1,500 + 4,800 + 1,000 = \boxed{7,300 \text{ Rs.}}$

Expected life = \sum probability \times Life (yrs)

$$= (0.67 \times 6) + (0.33 \times 9) = 4 + 3 = \boxed{7 \text{ years}}$$

Therefore, expected present worth

$$\begin{aligned} E(\text{PW}) &= E(\text{PW}) \text{ of profit} - E(\text{PW}) \text{ of initial cost} \\ &= 7,300 \times PVIFA_{(10\%, 7y)} - 25,000 = (7,300 \times 4.868) - 25,000 \\ &= 35,536.40 - 25,000 \\ &= \boxed{10,536.40 \text{ Rs.}} \end{aligned}$$

b) Calculation of expected present worth at different height

$$= \text{probability } \{ \text{Initial cost} + \text{Damage per year} \times PVIFA_{(5\%, 7y)} \}$$

E(PW) at height = 0

$$0.25 \{ 0 + 8,00,000 \times 5.786 \} = \boxed{11,57,198 \text{ Rs.}}$$

E(PW) at height = 20 Mts

$$0.05 \{ 7,00,000 + 5,00,000 \times 5.786 \} = \boxed{1,79,650 \text{ Rs.}}$$

E(PW) at height = 30 Mts

$$0.01 \{ 8,00,000 + 3,00,000 \times 5.786 \} = \boxed{25,358 \text{ Rs.}}$$

E(PW) at height = 40 Mts

$$0.002 \{9,00,000 + 2,00,000 \times 5.786\} = 4,114 \text{ Rs.}$$

Since E(PW) is minimum at height 40 Mts of the dam, therefore optimum height of dam is that height for which present value of relevance cost is minimum, that means, 40 meters.

2. ABC Ltd. is considering an investment proposal whose initial outlay is Rs. 100,000. Project life will be 4 years. Other estimates are:

Annual sales volume: 10,000 units

Fixed cost per annum: Rs. 26,00

Contribution per units: Rs. 6

Cost of capital: 8%

Present value of Rs. 1 payable or receivable annually at the end of 4 years at 8%: 3.3121.

- i) Find Net Present Value of the project
- ii) By how much can each factor change before ABC Ltd. becomes indifferent to the project?
- iii) Comment on the sensitivity of the factors based on your answers in (ii).

[WBUT 2016]

Answer:

Calculation of cash flow after tax

	Rs.
Contribution ($10,000 \times 6$)	60,000
Less: Fixed cost	26,000
(PBDT) Project before Depreciation and Tax	34,000
Less: Depreciation $\left(\frac{1,00,000}{4}\right)$	25,000
(PBT) Profit before tax	9,000
Less: Tax	Nil
(PAT) Profit after tax	9,000
Add: Depreciation	25,000
(CFAT) Cash flow after tax	34,000
PV of CFAT ($34,000 \times 3.3121$)	1,12,611
Less: Investment	1,00,000
NPV	12,611

- i) Contribution per unit

$$\text{If NPV} = 0, \text{ then CFAT} = \frac{1,00,000}{3.3121} = 30,192$$

$$\therefore \text{Contribution} = 26,000 + 30,192 = 56,192$$

$$\therefore \text{Contribution per unit} = \frac{56,192}{10,000} = 5.6192$$

POPULAR PUBLICATIONS

∴ Contribution per unit should decrease by $\frac{6 - 5.61926}{6} \times 100 = 6.35\%$

ii) Fixed cost for NPV to be zero = $60,000 - 30,192 = 29,808$ Rs.

∴ Fixed cost increased by $\frac{29,808 - 26,000}{26,000} \times 100 = 14.65\%$

iii) Sales volume for NPV = zero

Contribution = 56,192

When sale price per unit = 6 Rs.

Then sales volume = $\frac{56,192}{6} = 9,366$ units

∴ Sales volume should decrease by $\frac{10,000 - 9,366}{10,000} \times 100 = 6.35\%$

Therefore, it is clear than the sensitivity of NPV with respect to fixed cost is highest (14.65%) compared to sensitivity to sales price per unit and sales volume both of which are lower (6.35%).

UNCERTAINTY IN FUTURE EVENTS

Multiple Choice Type Questions

1. The present worth of an alternative is 0. What do we know about the value of the future worth? [WBUT 2012, 2017]

- a) FW < 0
- b) FW = 0
- c) FW > 0
- d) Cannot be determined without cash flows

Answer: (b)

2. If A and B are two independent events then $P(A \text{ and } B)$ [WBUT 2012, 2017]

- a) $P(A) \times P(B)$
- b) $P(A) + P(B)$
- c) $P(A) / P(B)$
- d) $P(A) - P(B)$

Answer: (a)

3. In a decision tree arrows coming out of which node have probabilities

[WBUT 2012, 2014, 2017]

- a) decision node
- b) random node
- c) both (a) and (b)
- d) none of these

Answer: (d)

4. If E_o = optimistic estimate [WBUT 2013]

E_m = most likely estimate, and

E_p = pessimistic estimate

then the average or mean value of a parameter for economic analysis is given by

- a) $(E_o + E_m - E_p)$
- b) $(E_o + E_m - E_p)/3$
- c) $(E_o + 2E_m + E_p)/4$
- d) $(E_o + 4E_m - E_p)/6$

Answer: (d)

5. Margin of safety is equal to

[WBUT 2014]

- a) actual sales minus BEP sales
- b) BEP sales minus Actual sales
- c) actual sales minus Actual cost
- d) none of these

Answer: (a)

6. If A and B are two mutually non-exclusive events, then $P(A \text{ or } B)$ is

- a) $P(A) \times P(B)$
- b) $P(A) + P(B)$
- c) $P(A) + P(B) - P(A)P(B)$
- d) $P(A)P(B) - P(A) - P(B)$

Answer: (b)

7. A numerical description of the outcome of an experiment is called a

- a) Descriptive statistic
- b) Probability Function [WBUT 2014]
- c) Variance
- d) Random Variable

POPULAR PUBLICATIONS

Answer: (b)

8. If A and B are two independent events then it can be expressed as [WBUT 2016]

- a) $P(A \cup B)$
- b) $P(A \times B)$
- c) $P(A) \times P(B)$
- d) none of these

Answer: (c)

9. In a decision tree the node with which probability is attached is called

[WBUT 2019]

- a) Decision node
- b) Random or Chance node
- c) Both (a) and (b)
- d) None of these

Answer: (b)

10. If A and B are two independent events then $P(A \cap B) =$ [WBUT 2019]

- a) $P(A/B) \times P(B)$
- b) $P(A) \times P(B)$
- c) $P(A \cup B)$
- d) $P(A) + P(B)$

Answer: (b)

Short Answer Type Questions

1. An aqueduct is needed to bring water into the city. It can be built at a reduced size now for Rs. 3 lakhs and enlarged 25 years later at Rs. 3.5 lakhs. The other option is to construct the full size aqueduct for Rs. 4 lakhs. Use Present Worth to find the better choice. [Given $i = 6\%$] [WBUT 2012, 2016, 2018]

Answer:

Option 1: Build at reduced size now and enlarged later –

$$\begin{aligned} PW &= 3,00,000 \times PVIF_{(6\%, 0 \text{yr})} + 3,50,000 \times PVIF_{(6\%, 25 \text{yr})} \\ &= (3,00,000 \times 1) + (3,50,000 \times 0.233) \\ &= 3,00,000 + 81,550 = 3,81,550 \end{aligned}$$

Option 2: Construct full size adequate now –

$$PW = 4,00,000 \times PVIF_{(6\%, 0 \text{yr})} = 4,00,000 \times 1 = 4,00,000 \text{ Rs.}$$

Since present worth of 1st option results in lower amount/cost, therefore the option to built at reduced size now and thereafter enlarge after 25 years should be followed.

2. Find the Equal Annual Worth (EAW) [WBUT 2012]

Initial Cost = Rs. 40,000

Salvage Value = Rs. 5,000

Revenue/year = Rs. 10,000

Life = 10 years

$i = 15\%$

Answer:

$$EAW = 10,000 - \frac{40,000}{PVIFA_{(10y, 15\%)}} + \frac{5,000}{FVIFA_{(10y, 15\%)}}$$

$$= 0,000 - \frac{40,000}{5.019} + \frac{5,000}{20.304} = 10,000 - 7970 + 246 = 2,276 \text{ Rs.}$$

3. What are the advantages of simulation?

[WBUT 2013]

Answer:

The main advantages of simulation techniques are as follows: –

- 1) Simulation, being flexible and straight-forward technique, is easier to apply than pure analytical methods.
- 2) It can be used to analyse large and complex real world systems, which cannot be solved by conventional quantitative technique models.
- 3) It is useful in solving such problems where all values of variables are not known in advance and there is no easy way to find these values.
- 4) Simulation may be the only method available when it is difficult to observe the actual reality.
- 5) Once a simulation model has been developed, it can be used over and over again to analyse different possible situations.
- 6) It can be used to study the interactive effect of individual components or variables in order to determine which ones are important.
- 7) Simulation is a valuable method of breaking down a complicated system into subsystems and then study each of these subsystems individually or jointly with others.
- 8) Usually data, for further analysis can be generated from a simulation model.

4. Differentiate between Risk and Return. Explain the role of sensitivity analysis in this context.

[WBUT 2016]

Answer:

Risk: Risk can be defined as the chance that the actual outcome from an investment will differ from the expected outcome. So more the variability of possible outcomes that can occur, will result in greater risk involvement.

Return: Return is the motivating factor that motivates the investor in the form of rewards, for undertaking the investment. Investors are taking all the efforts of investment to maximise their expected return from investment.

Risk – return trade off Financial decision depends on a careful judgment regarding risk-return trade off. Decision to invest money in government bonds is less risky as interest rate is known and the risk of default is negligible. Whereas, one may take more risk by deciding to invest in share market where there is expectation of getting more return that is uncertain. One should expect a lower return from government bond and higher return from shares. Basically, risk and expected return go hand by hand, the greater the risk, the greater the expected return.

Financial decisions of a firm are primarily guided by the risk-return trade off. The relation between return and risk can be shown as follows:

$$\text{Return} = \text{Risk free rate} + \text{Risk premium}$$

POPULAR PUBLICATIONS

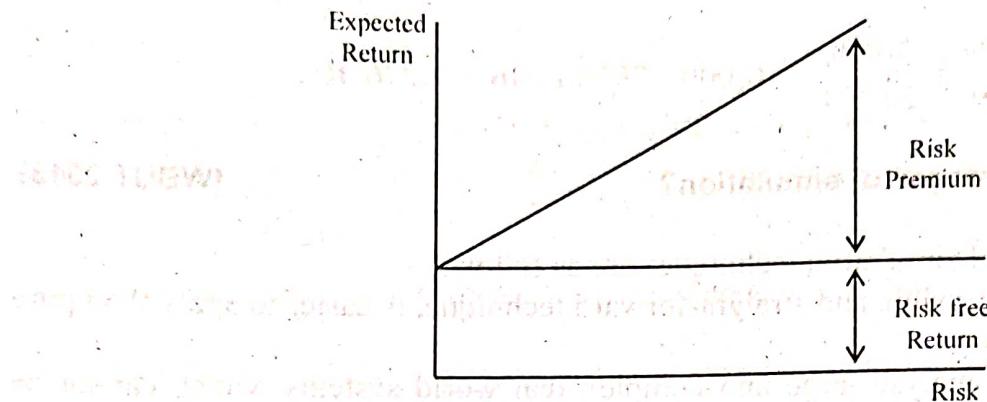


Fig: Risk – Return Relationship

5. What is 'Simulation Model'? How is the same practically applicable in decision making process? [WBUT 2017]

Answer:

Monte Carlo methods (or Monte Carlo experiments) are a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results. Their essential idea is using randomness to solve problems that might be deterministic in principle. They are often used in physical and mathematical problems and are most useful when it is difficult or impossible to use other approaches. Monte Carlo methods are mainly used in three distinct problem classes: optimization, numerical integration, and generating draws from a probability distribution.

In physics-related problems, Monte Carlo methods are useful for simulating systems with many coupled degrees of freedom, such as fluids, disordered materials, strongly coupled solids, and cellular structures (see cellular Potts model, interacting particle systems, McKean-Vlasov processes, kinetic models of gases). Other examples include modeling phenomena with significant uncertainty in inputs such as the calculation of risk in business and, in math, evaluation of multidimensional definite integrals with complicated boundary conditions. In application to space and oil exploration problems, Monte Carlo-based predictions of failure, cost overruns and schedule overruns are routinely better than human intuition or alternative "soft" methods.

In principle, Monte Carlo methods can be used to solve any problem having a probabilistic interpretation. By the law of large numbers, integrals described by the expected value of some random variable can be approximated by taking the empirical mean (a.k.a. the sample mean) of independent samples of the variable. When the probability distribution of the variable is parametrized, mathematicians often use a Markov Chain Monte Carlo (MCMC) sampler. The central idea is to design a judicious Markov chain model with a prescribed stationary probability distribution. That is, in the limit, the samples being generated by the MCMC method will be samples from the desired (target) distribution. By the ergodic theorem, the stationary distribution is approximated by the empirical measures of the random states of the MCMC sampler.

6. A box contains 6 white and 4 black balls. Two balls are drawn at random one after another without replacement. Prepare the joint probability distribution table.

[WBUT 2018]

Answer:**Joint Probability Distribution table****Combination****Joint Probability**

$$(1) \text{ 1}^{\text{st}} \text{ White + 2}^{\text{nd}} \text{ Black} = \frac{6}{10} \times \frac{4}{9} = 0.267$$

$$(2) \text{ 1}^{\text{st}} \text{ White + 2}^{\text{nd}} \text{ White} = \frac{6}{10} \times \frac{5}{9} = 0.333$$

$$(3) \text{ 1}^{\text{st}} \text{ Black + 2}^{\text{nd}} \text{ White} = \frac{4}{10} \times \frac{6}{9} = 0.267$$

$$(4) \text{ 1}^{\text{st}} \text{ Black + 2}^{\text{nd}} \text{ Black} = \frac{4}{10} \times \frac{3}{9} = 0.133$$

$$\text{Total Probability} = 1.000$$

Long Answer Type Questions

1. Suppose that an aircraft manufacturer desires to make a preliminary estimate of the cost of building a 600-MW fossil fuel plant for the assembly of its new long distance aircraft. It is known that a 200-MW plant costs \$100 million 20 years ago when the approximate cost index was 400 and that cost index is now 1200. The cost capacity factor for a fossil fuel power plant is 0.79. [WBUT 2012]

Answer:

Cost of building a 200 – MW plant 20 years ago = 100 million\$

\therefore Cost of building a 200 – MW plant 20 now

$$= \text{Cost building a 200 – MW plant 20 years ago} \times \frac{\text{Cost index now}}{\text{Cost index 20 years ago}}$$

$$= 100 \text{ million\$} \times \frac{1,200}{400} = 300 \text{ million\$}$$

Now, cost of building 600 MW-plant now

$$= \text{Cost building a 200 – MW plant now} \times \left[\frac{\text{size of new plant}}{\text{size of old plant}} \right]^{\text{cost capacity factor}}$$

$$= 300 \text{ million\$} \times \left[\frac{600 \text{ MW}}{200 \text{ MW}} \right]^{0.79}$$

$$= 300 \text{ million\$} \times [3]^{0.79} = 714.57 \text{ million\$ (approx.)}$$

2. a) What do you mean by economic decision tree? [WBUT 2013]

Answer:

Many project decisions are complex investment decisions. Such complex investment decisions involve a sequence of decisions over time. Decisions tree can handle the sequential decisions of complex investment proposals. The decision of taking up an investment project is broken into different stages. At each stage the proposal is examined

POPULAR PUBLICATIONS

to decide whether to go ahead or not. The multi-stages approach can be handled effectively with the help of decision trees. A decision tree presents graphically the relationship between a present decision and future events, future decisions and the consequences of such decisions.

Evaluation of decision tree approach

1. It portrays inter – related, sequential and critical multi dimensional elements of major project decisions.
2. Adequate attention is given to the critical aspects in an investment decision which spread over a time sequence.
3. Complex projects involve huge out lay and hence risky. There is the need to define and evaluate scientifically the complex managerial problems, arising out of the sequence of interrelated decisions with consequential outcomes of high risk. It is effectively answered by decision tree approach.
4. Structuring a complex project decision with many sequential investment decisions demands effective project risk management. This is possible only with the help of an analytical tool like decision tree approach.
5. Able to eliminate unprofitable outcomes and helps in arriving at optimum decision stages in time sequence.

b) A firm has identified three potential outcomes for an investment of \$1 million. The total returns from each investment plus the profits which will occur in less than 1 year and the associated probabilities are as follows:

A = \$1,400,000 with $P(A) = 0.2$; b = \$1,200,000 with $P(B) = 0.5$; and c = \$500,000 with $P(C) = 0.3$.

A consultant could be hired to provide additional information. The past record of the consultant in evaluating similar conditions is given in the table below, where A_c, B_c, C_c represent predictions by the consultant that, respectively, states A, B and C will occur. The table gives the probability of the consultant's prediction given that the state occurs.

Consultant's prediction	Occurrence of state		
	A	B	C
A_c	0.8	0.1	0.1
B_c	0.1	0.9	0.2
C_c	0.1	0.0	0.7

Construct a decision tree to represent the alternatives, outcomes and associated probabilities.

[WBUT 2013]

Answer:

Joint probability	\times Money value (\$)	= Product (\$)
$0.20 \times 0.80 = 0.16$	$\times 14,00,000$	= 2,24,000
$0.20 \times 0.10 = 0.02$	$\times 12,00,000$	= 24,000
$0.20 \times 0.10 = 0.02$	$\times 5,00,000$	= 10,000
	EMV	= 2,58,000
$0.50 \times 0.10 = 0.05$	$\times 14,00,000$	= 70,000
$0.50 \times 0.90 = 0.45$	$\times 12,00,000$	= 5,40,000

$$0.50 \times 0.0 = 0 \quad \times 0$$

NIL

$$\text{EMV} = \frac{\$100}{\$10,000}$$

$$\text{E.M.V.} = \frac{3,15,000}{75} = 42,000$$

~~12,000~~

$$= 1,05,000$$

$$\text{EMV} = \frac{1,05,000}{= 219,000}$$

EMV: ~~2,19,000~~

$$0.30 \times 0.10 = 0.03 \quad \times 14,00,000$$

$$0.30 \times 0.20 = 0.06 \quad \times 12,000,000$$

$$0.30 \times 0.70 = 0.21 \quad \times 5,00,000$$

1,500,000

3. a) Under capital rationing or capital constraint situation which method of capital budgeting is most suitable for project selection and why?

b) ABC Ltd. need your help in the selection of profitable projects out of the details given below:

Projects	Cash outlay (Rs.)	Annual Cash inflow (Rs.)	Life of the project (in years)
A	3,00,000	1,10,000	5
B	2,50,000	56,000	7
C	5,00,000	1,00,000	10
D	4,00,000	90,000	12
E	1,50,000	30,000	8

Company's required rate of return is 14%. Advise the management about the profitable project with the budget for capital expenditure of Rs. 8,00,000.

Given	Annuity factor @ 14%
for 5 years	3.433
for 7 years	4.288
for 8 years	4.639
for 10 years	5.217
for 12 years	5.660

[WBUT 2013]

Answer:

a) Under capital rationing situation when there is limited capital constraint, then profitability index or benefit-cost ratio method of capital budgeting is most suitable for project selection because it measures the return of the project per Rupees of capital

investment in the project because $\frac{PI}{BCR}$ method indicates relative figures, i.e., ratio instead of absolute figures as in case of NPV method.

$$b) \frac{BCR}{PI} = \frac{PV \text{ of cash inflows}}{PV \text{ of cash outflows}}$$

For Project A:

$$BCR = \frac{1,10,000 \times PVIFA_{(14\%, 5 \text{ yrs})}}{3,00,000} = \frac{1,10,000 \times 3.433}{3,00,000} = \frac{3,77,630}{3,00,000} = 1.259$$

POPULAR PUBLICATIONS

For Project B:

$$BCR = \frac{56,000 \times PVIFA_{(14\%, 7 \text{ yrs})}}{2,50,000} = \frac{56,000 \times 4.288}{2,50,000} = \frac{2,40,128}{2,50,000} = 0.961$$

For Project C:

$$BCR = \frac{1,00,000 \times PVIFA_{(14\%, 10 \text{ yrs})}}{5,00,000} = \frac{1,00,000 \times 5.217}{5,00,000} = \frac{5,21,700}{5,00,000} = 1.043$$

For Project D:

$$BCR = \frac{90,000 \times PVIFA_{(14\%, 12 \text{ yrs})}}{4,00,000} = \frac{90,000 \times 5.660}{4,00,000} = \frac{5,09,906}{4,00,000} = 1.274$$

For Project E:

$$BCR = \frac{30,000 \times PVIFA_{(14\%, 8 \text{ yrs})}}{1,50,000} = \frac{30,000 \times 4.639}{1,50,000} = \frac{1,39,170}{1,50,000} = 0.928$$

Therefore Project B and Project E are unprofitable and financially unviable because both their profitability index (BCR) are less than one. Project A, C & D are profitable projects ($BCR > 1$) and according to profitability index, their rankings are –

Project D → 1st rank (Cash outlay = 4,00,000 Rs.)

Project A → 2nd rank (Cash outlay → 3,00,000 Rs.)

Project C → 3rd rank (Cash outlay → 5,00,000 Rs.)

Therefore within the capital constraint of 8,00,000 Rs., Project D & A should be first implemented and due to scarcity of capital, implementation of Project C should be delayed.

4. a) Rolling a pair of six-sided dice has 36 possible outcomes. Each outcome is a sum of two numbers total in between 2 and 12 and with a probability of 1/36. A total of 2 can appear in one manner; a total of 3 can appear in two ways; a total of 4 can appear in three and so on. Find out the expected value. [WBUT 2013]

Answer:

Sum (1)	Combinations (Sample Space) (2)	Probability (3)	Product (4) = (1) × (3)
2	(1, 1)	$\frac{1}{36}$	$\frac{1}{18}$
3	(1, 2), (2, 1)	$\frac{2}{36}$	$\frac{1}{6}$
4	(1, 3), (3, 1), (2, 2)	$\frac{3}{36}$	$\frac{1}{3}$
5	(1, 4), (4, 1), (2, 3), (3, 2)	$\frac{4}{36}$	$\frac{5}{9}$
6	(1, 5), (5, 1), (2, 4), (4, 2), (3, 3)	$\frac{5}{36}$	$\frac{5}{6}$

<u>Sum (1)</u>	<u>Combinations (Sample Space) (2)</u>	<u>Probability (3)</u>	<u>Product (4) = (1) × (3)</u>
7	(1, 6), (6, 1), (2, 5), (5, 2), (3, 4), (4, 3)	$\frac{6}{36}$	$\frac{7}{6}$
8	(3, 5), (5, 3), (4, 4), (2, 6), (6, 2)	$\frac{5}{36}$	$\frac{10}{9}$
9	(3, 6), (6, 3), (4, 5), (5, 4)	$\frac{4}{36}$	$\frac{1}{1}$
10	(4, 6), (6, 4), (5, 5)	$\frac{3}{36}$	$\frac{5}{6}$
11	(5, 6), (6, 5)	$\frac{2}{36}$	$\frac{11}{18}$
12	(6, 6)	$\frac{1}{36}$	$\frac{1}{3}$

$$\text{Expected value} = \text{Sum of products} = \frac{116}{18} = 6.444$$

b) What is joint probability distribution? An article manufactured by a company consists of two parts I and II. In the process of manufacture of part I, 9 out of 100 are likely to be defective. Similarly, 5 out of 100 are likely to be defective in the manufacture of part II. Calculate the probability that the assembled article will not be defective. [WBUT 2013]

Answer:

1st Part:

Let S be a sample space of some given random experiment. We may assign two real numbers $X(e)$ and $Y(e)$ to each sample point e of s according to some given rules. We then have two random variables X and Y defined on the sample space S . the possible pairs of values (x, y) assumed by the two random variable X and Y together with the probabilities of all the pairs of values, gives the joint distribution of X and Y .

2nd Part:

Let A = event that part A is not defective,

B = event that part B is not defective,

We have to find the compound probability $P(AB)$ that part A is not defective, as well as part B is not defective,

But

$P(A)$ = Probability that part A is not defective;

= 1 - Probability that part A is defective,

$$= 1 - \frac{9}{100} = 0.91$$

POPULAR PUBLICATIONS

$$\text{Similarly, } P(B) = 1 - \frac{4}{100} = 0.96$$

Assuming that events A and B are independent, the required probability is:

$$P(AB) = P(A).P(B) = 0.91 \times 0.96 = 0.8736$$

5. Box I contains 6 white and 4 black balls and Box II contains 5 white and 5 black balls. A box is selected at random and a ball is selected from the box. If for Box I, a person receives Rs. 2 and Box II pays Re. 1 and for each white ball the person gives Rs. 5 and for every black ball a person receives Rs. 8, find the expected gain.

[WBUT 2015]

Answer:

Alternative No.	Box No. (1)	Colour of ball (2)	Receipt (Rs.) (3)	Payment (Rs.) (4)	Probability (5)	Expected net gain/loss (Rs) (6) = {(3) - (4)} × (5)
1	I	White	+2	-5	$\frac{1}{2} \times \frac{6}{6+4} = \frac{3}{10}$	-0.90
2	I	Black	+2	+8	$\frac{1}{2} \times \frac{4}{6+4} = \frac{1}{5}$	+2.00
3	II	White	-1	-5	$\frac{1}{2} \times \frac{5}{5+5} = \frac{1}{4}$	-1.50
4	II	Black	-1	+8	$\frac{1}{2} \times \frac{5}{5+5} = \frac{1}{4}$	+1.75
Expected gain →						+1.35

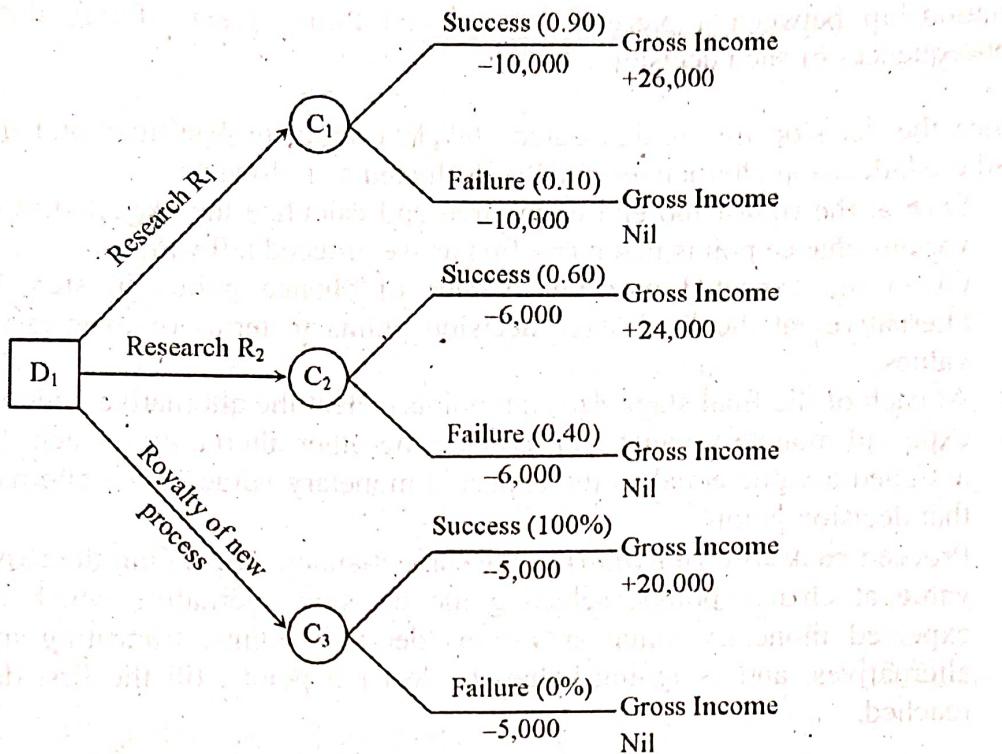
6. A company is currently working with a process, which after paying for materials, labor etc. brings a profit of Rs. 12,000. The company has the following alternatives:

- i) The company can conduct research R_1 which is expected to cost Rs. 10,000 and having 90% probability of success. If successful, the gross income will be Rs. 26,000.
- ii) The company can conduct research R_2 which is expected to cost Rs. 6,000 and having 60% probability of success. If successful, the gross income will be Rs. 24,000.
- iii) The company can pay Rs. 5,000 as royalty of a new process. If will bring a gross income of Rs. 20,000.

Because of limited resources, only one of the two types of research can be carried out at a time. Draw the decision tree and find the optimal strategy for the company.

[WBUT 2015]

Answer:



Calculation of Expected Monetary value

Chance point	Activity	$EMV = \sum px$ $(= \sum \text{Probability} \times \text{Net Income})$
C ₁	Research R ₁	$0.90(26,000 - 10,000) + 0.10(-10,000)$ $= 14,400 - 1,000 = 13,400 \text{ Rs.}$
C ₂	Research R ₂	$0.60(24,000 - 6,000) + 0.40(-6,000)$ $= 10,800 - 2,400 = 8,400 \text{ Rs.}$
C ₃	New process	$1.00(20,000 - 5,000) + \text{nil}(-5,000)$ $= 15,000 - \text{nil} = 15,000 \text{ Rs.}$

∴ Optimal strategy: Royalty for new process because has maximum EMV.

7. Define Decision Tree. Explain the different steps of making Decision Tree.

[WBUT 2016]

Answer:

Many project decisions are complex investment decisions. Such complex investment decisions involve a sequence of decisions over time. Decisions tree can handle the sequential decisions of complex investment proposals. The decision of taking up an investment project is broken into different stages. At each stage the proposal is examined to decide whether to go ahead or not. The multi-stages approach can be handled effectively with the help of decision trees. A decision tree presents graphically the

POPULAR PUBLICATIONS

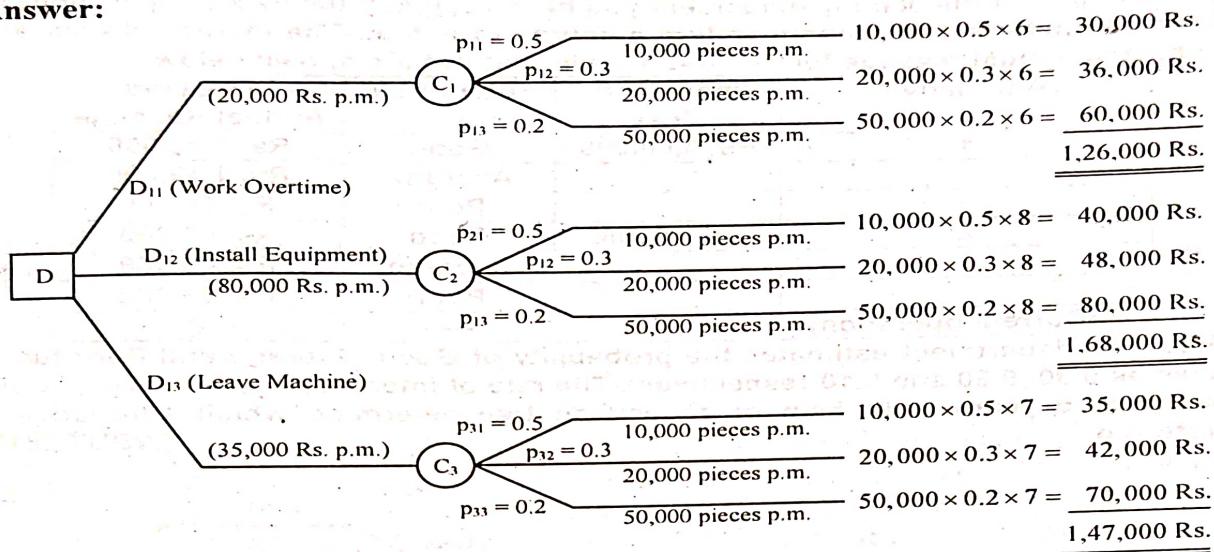
relationship between a present decision and future events, future decisions and the consequences of such decisions.

Once the decision tree is delineated and data about probabilities and monetary values gathered, decision alternatives may be evaluated as follows:

1. Start at the right-hand end of the tree and calculate the expected monetary value at various chance points that come first as we proceed leftward.
 2. Given the expected monetary values of chance points in step 1, evaluate the alternatives at the final stage decision points in terms of their expected monetary values.
 3. At each of the final stage decision points, select the alternative which has the highest expected monetary value and truncate the other alternatives. Each decision point is assigned a value equal to the expected monetary value of the alternative selected at that decision point.
 4. Proceed backward (leftward) in the same manner, calculating the expected monetary value at chance points, selecting the decision alternative which has the highest expected monetary value at various decision points, truncating inferior decision alternatives, and assigning values to decision points, till the first decision point is reached.
8. ABC Toys Pvt. Ltd. is considering the addition of a new toy to its existing product line. Three alternative courses of action are available:
- a) Work overtime to meet the demand of the new toy. Overtime expenses are estimated at Rs. 20,000 per month
 - b) Install new equipment for which fixed expenses per month are expected at Rs. 80,000
 - c) Lease (rent) a machine at the rate of Rs. 35,000 per month
- Variable cost associated with the above three alternatives are Rs. 9, Rs. 7, Rs. 8 respectively. The price per unit of the toy, which is independent of the manufacturing alternative, is fixed at Rs. 15. The expected demand for the toy is given below:
- 10000 pieces with the probability of 0.5
 - 20000 pieces with the probability of 0.3
 - 50000 pieces with the probability of 0.2
- Which alternative should the company adopt to manufacture the toy? Use decision tree.

[WBUT 2018]

Answer:



Therefore Profit Computation for the three alternations are:

$$D_{11} (\text{Work Overtime}): 1,26,000 - 20,000 = 1,06,000 \text{ Rs.}$$

$$D_{12} (\text{Install Equipment}): 1,68,000 - 80,000 = 88,000 \text{ Rs.}$$

$$D_{13} (\text{Leave Machine}): 1,47,000 - 35,000 = 1,12,000 \text{ Rs.}$$

Since Profit of D₁₃ is maximum, therefore, the company should lease a machine to manufacture the toy. (Ans.)

Working (Calculation of contribution per unit)

	D ₁₁	D ₁₂	D ₁₃
Selling price (per unit)	15 Rs.	15 Rs.	15 Rs.
Loss: Variable cost (per unit)	9 Rs.	7 Rs.	8 Rs.
Contribution (per unit)	6 Rs.	8 Rs.	7 Rs.

[WBUT 2019]

9. a) What is decision tree?

Answer:

Refer to Question No. 2(a) of Long Answer Type Questions.

b) Ms. Sameera Goel is the vice president of an 'Oil Company', who is concerned about the plant's current production capability. She has three alternatives. The first alternative would result in significant changes in present operations, including increased automation. The second one involves small changes in plant operation and would not include any new automation. The third alternative is to make no changes (do nothing).

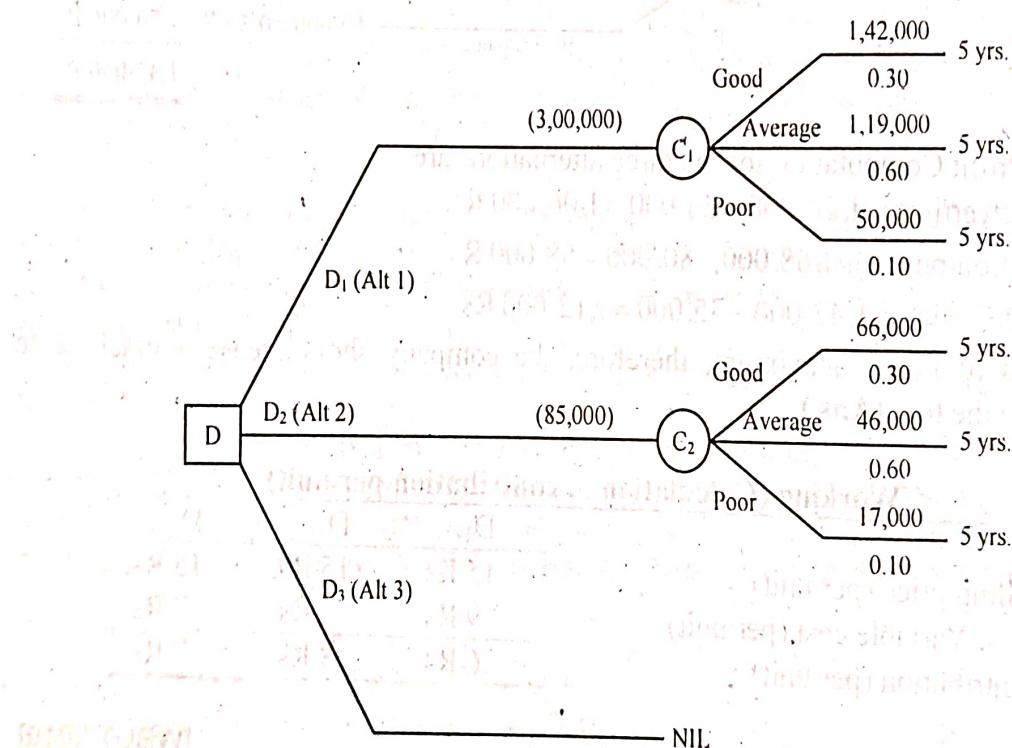
As a member of the plant management you have assigned the task of analyzing the three alternatives and recommending a course of action. The increased cost and increased annual revenue for the first two alternatives are shown below:

Alternative	Increased Cost	Future Sale	Increased Annual Revenue
1	Rs. 3,00,000	Good	Rs. 1,42,000
		Average	Rs. 1,19,000
		Poor	Rs. 50,000
2	Rs. 85,000	Good	Rs. 66,000
		Average	Rs. 46,000
		Poor	Rs. 17,000
3 (Current operation)	0	-----	0

The sales department estimates the probability of Good, Average and Poor future sales as 0.30, 0.60 and 0.10 respectively. The rate of interest per year is 20%, study period is 5 years. with help of a decision tree determine which alternative is preferred.

[WBUT 2019]

Answer:



Evaluation at C₁

$$= PVIFA_{(20\%, 5y)} \{ (0.30 \times 1,42,000) + (0.60 \times 1,19,000) + (0.10 \times 50,000) \}$$

$$= 2.991 \{ 42,600 + 71,400 + 5,000 \} = 3,55,929 \text{ Rs.}$$

Evaluation at C₂

$$= PVIFA_{(20\%, 5y)} \{ (0.3 \times 66,000) + (0.6 \times 46,000) + (0.1 \times 17,000) \}$$

$$= 2.991 \{ 19,800 + 27,600 + 1,700 \} = 1,46,858 \text{ Rs.}$$

Therefore Net Present Value for Alternatives are

$$\text{Alternative 1 (D}_1\text{)} = 3,55,929 - 3,00,000 = 55,929 \text{ Rs.}$$

$$\text{Alternative 2 (D}_2\text{)} = 1,46,858 - 85,000 = 61,858 \text{ Rs.}$$

$$\text{Alternative 3 (D}_3\text{)} = \text{Nil}$$

Therefore the preferred alternative is Alternative 2 because if it is adopted then it will result in Highest NPV.

10. Write short notes on the following:

a) Risk versus return [WBUT 2013]

b) Economic Decision Tree [WBUT 2014]

c) Conditional probability [WBUT 2016]

d) Probability & Joint probability [WBUT 2019]

Answer:

a) **Risk versus return:**

Return from an investment is the difference between actual amount invested and actual money received from it. Suppose a person has invested one hundred rupees and received one hundred and fifty rupees after one year. Here the person has earned fifty rupees on his investment. This fifty rupees return may be defined as absolute return. His holding period return will be –

$$\text{Holding period return} = \frac{\text{Terminal value} - \text{initial investment}}{\text{Initial investment}} \times 100$$

$$= \frac{150 - 100}{100} \times 100 = 50\%$$

Total return from an investment can be broadly divided into two parts. They are –

i) **Dividend or interest:** Investment in equity share may provide dividend return to us. As we know dividend is a portion of the profit earned, which is distributed among the shareholders. Percentage of dividend is uncertain. It is paid only when sufficient distributable profit is available, liquidity position is good and Board of Directors has accepted such decision.

Instead of equity share we can invest in coupon bearing bond. Here coupon will mean interest rate. Interest is paid irrespective of the profit made. It is paid even when there is a loss. Interest rate is prefixed. It is stated at the time of issue of bond. Like dividend, no uncertainty exists in the interest amount receivable.

ii) **Capital gain/loss:** It is the difference between initial value of investment and its terminal value. Here terminal value will mean the value of the investment when it is terminated/ disposed off.

Considering the above two components of total return, we can modify formula of holding period return as follows –

$$\text{Holding period return} = \frac{\text{Dividend/Interest} + (\text{Terminal value} - \text{initial value})}{\text{Initial value}} \times 100$$

All investment has some risk. Degree of risk in each case may be different. Therefore an appropriate mathematical technique is required for its measurement.

Risky investment is an environment where decision maker is not certain that a thing will happen. There are more than one alternative. Decision maker can assign probability of occurrence of each alternative. Degree of risk associated with an investment opportunity is measured by the scatterness of its return. In statistics different methods are available for measuring scatterness of data. Among them standard deviation is considered as the best one. It is the root value of variance. Variance is the average of squared deviations of different returns from its mean value. If there are n possible returns R_1, R_2, \dots, R_n and their mean value is μ , then risk of the investment opportunity is –

$$\text{Risk} = \sigma = \sqrt{(R_i - \mu)^2 / n}$$

b) Economic Decision Tree:

Refer to Question No. 2(a) of Long Answer Type Questions.

c) Conditional probability:

Conditional probability is a measure of the probability of an event given that (by assumption, presumption, assertion or evidence) another event has occurred. If the event of interest is A and the event B is known or assumed to have occurred, "the conditional probability of A given B ", or "the probability of A under the condition B ", is usually written as $P(A|B)$, or sometimes $P_B(A)$. For example, the probability that any given person has a cough on any given day may be only 5%. But if we know or assume that the person has a cold, then they are much more likely to be coughing. The conditional probability of coughing given that you have a cold might be a much higher 75%.

The concept of conditional probability is one of the most fundamental and one of the most important concepts in probability theory. But conditional probabilities can be quite slippery and require careful interpretation. For example, there need not be a causal or temporal relationship between A and B .

$P(A|B)$ may or may not be equal to $P(A)$ (the unconditional probability of A). If $P(A|B) = P(A)$ (or its equivalent $P(B|A) = P(B)$), then events A and B are said to be independent: in such a case, having knowledge about either event does not change our knowledge about the other event. Also, in general, $P(A|B)$ (the conditional probability of A given B) is not equal to $P(B|A)$. For example, if you have cancer you might have a 90% chance of testing positive for cancer. In this case what is being measured is that the if event B "having cancer" has occurred, the probability A - test is positive given that B having cancer occurred is 90%, $P(A|B) = 90\%$. Alternatively, you can test positive for cancer but you may have only a 10% chance of actually having cancer because cancer is very rare. In this case what is being measured is the probability of the event B - having cancer given that the event A - test is positive has occurred, $P(B|A) = 10\%$. Falsely equating the two probabilities causes various errors of reasoning such as the base rate fallacy. Conditional probabilities can be correctly reversed using Bayes' theorem.

d) Probability & Joint probability:

Probability is a measure of the likelihood of an event to occur. Many events cannot be predicted with total certainty. We can predict only the chance of an event to occur i.e. how likely they are to happen, using it. Probability can range in between 0 to 1; where 0 means the event to be an impossible one and 1 indicates a certain event. Probability for class 10 is an important topic for the students which explain all the basic concepts of this topic. The probability of all the events in a sample space sums up to 1.

Probability of event to happen $P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total Number of outcomes}}$

A joint probability, in probability theory, refers to the probability that two events will both occur. In other words, joint probability is the likelihood of two events occurring together.

- $P(A \cap B)$ is the notation for the joint probability of event "A" and "B".
- $P(A)$ is the probability of event "A" occurring.
- $P(B)$ is the probability of event "B" occurring.
- $P(A \cap B) = P(A) * P(B)$

For joint probability calculations to work, the events must be independent. In other words, the events must not be able to influence each other. If the outcome of one event does not affect the outcome of the other event, the events are independent.

DEPRECIATION

Multiple Choice Type Questions

1. If tax life is N years then for double depreciation, depreciation rate then would be given by [WBUT 2013]

- a) $2 \times N$
- b) $200\% / N$
- c) $100\% / N$

$$d) N^2$$

Answer: (b)

2. Depreciation charged on plant and machinery is [WBUT 2019]

- a) Discretionary Cost
- b) Committed Cost
- c) Conversion Cost
- d) Future Cost

Answer: (b)

3. Which of the following is correct? [MODEL QUESTION]

- a) Depreciation is the permanent and continuous decrease in the market value of a fixed asset due to use, defluxion of time, obsolescence, expiration of legal rights or any other cause.
- b) Depletion refers to the economic deterioration by the exhaustion of natural (e.g. ore deposits in mines) resources.
- c) Obsolescence refers to the physical deterioration by (i) invention of improved technique or equipment (ii) market decline due to change in taste and fashion etc. (iii) inadequacy of existing plant to meet the increased business.
- d) Amortization refers to the physical deterioration by the expiration of intangible assets (e.g. Goodwill, Patents)

Answer: (a)

4. Type of depreciation that arises out of economic factors like suppression, obsolescence and inadequacy is called [MODEL QUESTION]

- a) physical depreciation
- b) functional depreciation
- c) accidental depreciation
- d) non-functional depreciation

Answer: (b)

5. Which of the following assets does not depreciate? [MODEL QUESTION]

- a) Machinery and Equipment
- b) Patents
- c) Land
- d) Furniture

Answer: (c)

6. Depletion refers to

[MODEL QUESTION]

- a) Wastage of output in process industries
- b) Gradual exhaustion of wasting assets
- c) Loss of value of an asset due to new technology
- d) None of these

Answer: (b)

7. The main cause of depreciation includes

- a) Physical wear & tear
- b) Passage of time
- c) Changes in economic development
- d) Expiration of legal Rights
- e) All of these

Answer: (e)

[MODEL QUESTION]

Short Answer Type Questions

1. From the following information calculate the annual depreciation based on historical and replacement cost respectively and show the amount of additional depreciation that should be provided in each year.

Cost of machinery Rs. 20,000

Estimated life 4 years

Residual Value NIL

Inflation factor 10% p.a

Use straight-line method for computing depreciation.

[WBUT 2012]

Answer:

Nominal depreciation per annum

$$= \frac{\text{Original cost} - \text{Residual value}}{\text{Estimated life in years}} = \frac{20,000 - \text{Nil}}{4} = 5,000 \text{ Rs. per annum}$$

Current value of asset after inflation = $20,000 \times 1.10 = 22,000$ Rs.

Additional depreciation to be charged per annum

$$= \frac{22,000 - \text{Nil}}{4} - 5,000 = 5,400 - 5,000 = 400 \text{ Rs.}$$

2. Distinguish between Depreciation and Obsolescence.

[WBUT 2015]

Solve:

A company purchased a machine on 1st April 2012 for Rs. 2,60,000; Shipping and forwarding charges: Rs. 10,000; Import duty: Rs. 12,000; Installation charges: Rs. 10,000; Depreciation is to be charged under diminishing balance method at 1st year – 10% p.a.; 2nd year – 20% p.a., 3rd year – 30% p.a. Calculate the amount of depreciation each year.

Answer:

1st part:

Depreciation is the decrease of worth of fixed assets with the passage of time and use. It is derived from the Latin word depretium; which means declining worth. Depreciation may be found in form of physical depreciation, economic depreciation and accounting depreciation etc.

Depreciation is a permanent continuing and gradual shrinkage in the book value of fixed asset. It is charged on the fixed assets only. The institute of Chartered Accountants of India defines depreciation as a measure of the wearing out consumption or other loss of a value of a depreciable asset arising from use, efflux of time or obsolescence through technology and market changes.

POPULAR PUBLICATIONS

Obsolescence is one of the causes of depreciation; other causes may be wear and tear of the asset, Accidents, elapsement of time, Depletion etc. Obsolescence means because of technological advancement, the assets in use may become out dated and loose a larger part of its value. Inadequacy refers to the termination of the use of an asset because of growth and changes in the size of the firm.

2nd part:

Date	Particulars	Rs.
01.04.1012	Purchase Price	2,60,000
	Shipping & Forwarding	10,000
	Import Duty	12,000
	Installation Charges	10,000
	Historical Cost →	2,92,000
2012-2013	Depreciation (10%)	(29,200)
01.04.2013	W.D.V	2,62,800
2013-2014	Depreciation (20%)	(52,560)
01.04.2014	W.D.V	2,10,240
2014-2015	Depreciation (30%)	(63,072)
31.03.2014	W.D.V	1,47,168

3. What are the different methods of calculating depreciation?

[WBUT 2017]

Answer:

Methods of Allocating Depreciation

There are several methods of allocating depreciation over the useful lives of the assets. Those most commonly employed in industrial and commercial enterprises are the Straight Line Method (SLM) and the Written Down Value Method (WDV).

Straight Line Method of Depreciation (SLM)

Meaning under the straight line method, a fixed and equal amount in the form of depreciation, according to a fixed percentage on the original cost, is written off during each accounting period over the expected useful life of the asset.

How to calculate the Rate of Depreciation under SLM: The rate of depreciation is calculated as follows:

$$\text{Step 1: Amount of Depreciation} = \frac{\text{Original cost less Residual value}}{\text{Expected useful life of the asset}}$$

$$\text{Step 2: Rate of Depreciation} = \frac{\text{Amount of Depreciation}}{\text{Original Cost}} \times 100$$

Written Down Value Method (WDV)

In this method rate of depreciation falls on WDV of the assets and the rate of depreciation is calculated by the following formula:

$$r = 1 - \sqrt[n]{\frac{S}{C}}$$

where r = W.D.V rate of Depreciation

S = Salvage value

C = Original cost of the asset.

4. An asset purchased at Rs. 17,000 has a life time of 5 years and salvage value of Rs. 2,000. If depreciation is computed using straight line method, calculate the book value of the asset at the end of 3 years. [WBUT 2018]

Answer:

In straight line method, depreciation per annum is calculated by following

$$\frac{\text{Historical cost} - \text{Salvage value}}{\text{No. of years of useful life}}$$

Here, given, historical cost = 17,000 Rs., Salvage value = 2,000 Rs., Useful life = 5 years.

$$\therefore \text{Depreciation per annum} = \frac{17,000 - 2,000}{5} = 3,000 \text{ Rs.}$$

Statement of calculation of Asset

Particulars	Rs.
Original cost	17,000.00
Less: Depreciation for 1 st year	3,000.00
Book value at end of 1 st year	14,000.00
Less: Depreciation for 2 nd year	3,000.00
Book value at end of 2 nd year	11,000.00
Less: Depreciation for 3 rd year	3,000.00
Book value at end of 3 rd year	8,000.00

5. Explain the causes of depreciation.

Answer:

[MODEL QUESTION]

Causes of depreciation

- Physical depreciation:** It is caused mainly by wear and tear of the asset in the normal production process. erosion, rust and decay are causes of depreciation also.
- Accidents:** It is another important contributing factor to depreciation. The value of fixed assets decline due to break down, loss by fire etc.
- Absolenscence:** Depreciation also starts due to absolenscence. It means because of technological advancement, the assets in use may become out dated and loose a larger part of its value. Inadequacy refers to the termination of the use of an asset because of growth and changes in the size of the firm.
- Time factor:** There are certain assets with a fixed period of legal life such as lease, patent and copyrights. For instance, a lease can be entered into for any period while a patent's legal life is for some years but on certain grounds this can be extended. Provision for the consumption of these assets is called amortization rather than depreciation.
- Depletion:** Some assets are of a wasting character perhaps due to the extraction of raw-materials from them. These materials are then either used by firm or sold.

POPULAR PUBLICATIONS

Natural resources such as mines, quarries and oil wells come under this segments.
The declining value of asset due to some extraction is called as depletion.

6. A company has purchased an equipment whose first cost is Rs. 1,00,000 with an estimated life of 8 years. The estimated salvage value of the equipment at the end of its life time is Rs. 20,000. Compute the deprecations and the Book Value for the year five. [MODEL QUESTION]

Answer:

$$1^{\text{st}} \text{ cost (P)} = \text{Rs. } 1,00,000$$

$$\text{Salvage value (S)} = 20,000$$

$$N = 8 \text{ years}$$

Depreciation for the 5th year

$$D_s = \frac{P - S}{N} (\text{same for all year}) = \frac{1,00,000 - 20,000}{8} = \text{Rs. } 10,000$$

$$\text{Book Value}_s = P - n \left(\frac{P - S}{N} \right) = 1,00,000 - 5 \times 10,000 = 1,00,000 - 50,000 = \text{Rs. } 50,000$$

Long Answer Type Questions

1. Write short note on Depreciation.

[WBUT 2019]

Answer:

Depreciation is the decrease of worth of fixed assets with the passage of time and use. It is derived from the Latin word depretium, which means declining worth. Depreciation may be found in form of physical depreciation, economic depreciation and accounting depreciation etc.

Depreciation is a permanent continuing and gradual shrinkage in the book value of fixed asset. It is charged on the fixed assets only. The institute of Chartered Accountants of India defines depreciation as a measure of the wearing out consumption or other loss of a value of a depreciable asset arising from use, affluxion of time or obsolescence through technology and market changes.

Needs for depreciation:

- It is necessary to ascertain true profit or net profit of a business.
- It represents true and fair view of financial position.
- It assures the exact cost of production
- It is necessary to comply legal requirements
- It is needed to accumulate funds for replacement of assets

Features of depreciation;

- It is non cash expenses
- It may be physical or functional
- It is a process of allocation of cost
- It is charged on fixed assets
- It shows the financial strength of a firm
- It does not depend upon the fluctuation of market prices

2. Calculate the Rate of Depreciation under Straight Line Method (SLM) in each of the following alternative cases: [MODEL QUESTION]

Case	Purchase Price of Machine Rs	Expenses to be Capitalized Rs.	Estimated Residual value Rs.	Expected useful Life
a.	80,000	20,000	40,000	4 years
b.	17,000	3,000	2,000	10 years
c.	45,000	5,000	10,000	10 years
d.	2,00,000	50,000	25,000	5 years

Answer:

Calculation of Total Cost of Asset

Total Cost of Asset = Purchase Price + Expenses to be capitalized

$$\text{Case (a)} = \text{Rs. } 80,000 + \text{Rs. } 20,000 = \text{Rs. } 1,00,000$$

$$\text{Case (b)} = \text{Rs. } 17,000 + \text{Rs. } 3,000 = \text{Rs. } 20,000$$

$$\text{Case (c)} = \text{Rs. } 45,000 + \text{Rs. } 5,000 = \text{Rs. } 50,000$$

$$\text{Case (d)} = \text{Rs. } 2,00,000 + \text{Rs. } 50,000 = \text{Rs. } 2,50,000$$

Calculation of Amount of depreciation per year

Amount of Depreciation = Total cost of Asset = Estimated Residual Value/ Expected

Amount of Depreciation = $\frac{\text{Total cost of Asset} - \text{Estimated Residual Value}}{\text{Expected useful life}}$

$$\text{Case (a)} = \text{Rs. } 1,00,000 - 40,000 / 4 = \text{Rs. } 15,000$$

$$\text{Case (b)} = \text{Rs. } 20,000 - 2,000 / 10 = \text{Rs. } 1,800$$

$$\text{Case (c)} = \text{Rs. } 50,000 - 10,000 / 10 = \text{Rs. } 4,000$$

$$\text{Case (d)} = \text{Rs. } 2,50,000 - 25,000 / 5 = \text{Rs. } 45,000$$

Calculation of Rate of Depreciation SLM

Rate of Depreciation (under SLM) = $\frac{\text{Amount of Depreciation}}{\text{Total cost of Asset}} \times 100$

$$\text{Case (a)} = \text{Rs. } 15,000 / 1,00,000 \times 100 = 15\%$$

$$\text{Case (b)} = \text{Rs. } 1,800 / 20,000 \times 100 = 9\%$$

$$\text{Case (c)} = \text{Rs. } 4,000 / 50,000 \times 100 = 8\%$$

$$\text{Case (d)} = \text{Rs. } 45,000 / 2,50,000 \times 100 = 18\%$$

REPLACEMENT ANALYSIS

Multiple Choice Type Questions

1. A machine worth Rs. 1,00,000 is purchase by paying Rs. 20,000 down payment and 12 monthly installments of Rs. 8,000 each. The book cost at time of purchase is [WBUT 2012, 2017]

- a) Rs. 1,00,000
- b) Rs. 8,000
- c) Rs. 80,000
- d) Rs. 12,000

Answer: (a)

2. A replacement decision is a choice between the present asset, sometimes called the and currently available replacement alternatives, sometimes called [WBUT 2013]

- a) defender, challenger
- b) challenger, defender
- c) defender, protector
- d) protector, defender

Answer: (a)

3. The example of Replacement problem is [WBUT 2015]

- a) Obsolescence
- b) Depletion
- c) Deterioration due to aging
- d) All of these

Answer: (d)

4. In Replacement Analysis, the existing asset which is considered for replacement is called asset. [WBUT 2015]

- a) challenger
- b) striker
- c) winger
- d) defender

Answer: (d)

5. Which are the determinants of economic life of an asset? [WBUT 2016]

- a) Capital recovery cost
- b) Average operating and maintenance cost
- c) Sum of capital recovery cost
- d) all of these

Answer: (d)

6. In replacement analysis old machines are known as [WBUT 2018]

- a) Defender
- b) Challenger
- c) Both (a) and (b)
- d) None of these

Answer: (a)

7. Defender refers to

[MODEL QUESTION]

- a) replacing the existing facility
- b) technique of replacement analysis
- c) the existing facility which is to be replaced
- d) none of these

Answer: (c)

Long Answer Type Questions

1. Initial Cost = Rs. 60,000

[WBUT 2015]

Year	1	2	3	4	5
Resale Value	42,000	30,000	20,400	14,400	9,650
Maintenance Cost	18,000	20,270	22,880	26,700	31,800

Find the year in which the machine would be replaced.

Answer:

Year	Resale Value (Rs.)	Maintenance Cost (Rs.)	Cumulative maintenance (Rs.)	Net cost (Rs.)	Average Net cost per yr.(Rs.)
(1)	(2)	(3)	(4)	(4)=(4)-(2)	(5)/(1)
01.	42,000	18,000	18,000	(24,000)	(24,000)
02.	30,000	20,270	38,270	8,270	4,135
03.	20,400	22,880	61,150	40,750	13,583
04.	14,400	26,700	87,850	73,450	18,363
05.	9,650	31,800	1,19,650	1,10,000	22,000

Therefore machine should be replaced at the end of 2nd year when the Average Net Cost is minimum.

2. a) What do you understand by replacement analysis? Explain 'Economic life' of an asset.

[WBUT 2018]

Answer:

Replacement analysis is the systematic and economically evaluating decisions of either retaining the existing asset/equipment or acquiring new equipment by replacing the existing equipment. The existing facility is termed as defender and that of replacing the existing facility by choosing the best course of action among the alternative available is the challenger. Replacement Analysis deals with evaluation of defender and challenger. Various replacement analysis techniques are applied depending different circumstances for existing installed asset / defender against the best current available asset / challenger. If the defender proves to be economical it will be retained or otherwise it will be replaced with challenger. Various techniques are determined by preparing a replacement decision mapping.

Economic life of an asset is the useful life, i.e., The expected (estimated) period that a property will be used in a trade or business to produce income. It is not how long the property will last but how long the owner expects to productively use it.

POPULAR PUBLICATIONS

b) A firm has purchased an equipment at Rs. 20,000. When should the asset be replaced, if the following is given. [WBUT 2018]

End of year	Operation cost in (Rs.)	Maintenance cost in (Rs.)	Resale value in (Rs.)
1	2,000	200	10,000
2	3,000	300	9,000
3	4,000	400	8,000
4	5,000	500	7,000
5	6,000	600	6,000
6	7,000	700	5,000
7	8,000	800	4,000
8	9,000	900	3,000
9	10,000	1,000	2,000
10	11,000	1,100	1,000

Answer:

(1) t	(2) $s(t)$	(3) $O - s(t)$	(4) $m(t)$	(5) $\int_0^t m(t) dt$	(6) = (3) + (5) T	(7) = (6)/(1) T_A
1	10,000	10,000	2,200	2,200	12,200	12,200
2	9,000	11,000	3,300	5,500	16,500	8,250
3	8,000	12,000	4,400	9,900	21,900	7,300
4	7,000	13,000	5,500	15,400	28,400	7,100
5	6,000	14,000	6,600	22,000	36,000	7,200

Here, t = end of year

$s(t)$ = Resale value at end of the year

O = Original cost = 20,000 Rs.

$m(t)$ = Operation and maintenance cost

$\int_0^t m(t) dt$ = Cumulative operation and maintenance cost

$O - s(t)$ = Net original cost at end of t^{th} year

T = Total cost = $O - s(t) + \int_0^t m(t) dt$

T_A = Average total cost = $\frac{T}{t}$

From the table it is clear that the average total cost (T_A) is minimum at end of 4th year, i.e., Rs. 7,100. Therefore the equipment should be replaced at end of 4th year.

ACCOUNTING

Multiple Choice Type Questions

1. Which one is the right Accounting Equation? [WBUT 2012, 2013, 2017]

- a) Assets – Liabilities = Capital
- b) Assets + Liabilities = Capital
- c) Assets + Capital = Liabilities
- d) none of these

Answer: (a)

2. Return of shareholders' fund is determined by which of the following formula?

- a) net profit after tax / shareholders' fund
- b) net profit after tax / shareholders' equity
- c) net profit before / shareholders' fund
- d) net profit before tax / shareholders' equity

Answer: (a)

3. Patent is an example of

[WBUT 2014]

- a) current asset
- b) fixed asset
- c) fictitious assets
- d) intangible assets

Answer: (d)

4. Current Ratio is the ratio of

[WBUT 2014]

- a) Current Asset by Current Liabilities
- b) Current Liabilities by Current Asset
- c) Current Capital by Current Asset
- d) Current Capital by Current Liabilities

Answer: (a)

5. In Double Entry System of Book Keeping every business transaction affects

[WBUT 2015]

- a) two accounts
- b) two sides of same account
- c) the same account on two different dates
- d) all of these

Answer: (a)

6. Which of the following balance appears on the debit side of the Trial Balance?

[WBUT 2015]

- a) A loss
- b) An expenditure
- c) An Asset
- d) All of these

Answer: (d)

7. Accounting Equation is

[WBUT 2016]

- a) Capital = Assets – Liabilities
- b) Liabilities = Capital – Assets
- c) Assets = Capital – Liabilities
- d) none of these

Answer: (a)

POPULAR PUBLICATIONS

8. If Current Ratio is 2.2 and Current Liability is Rs. 80,000 then the amount of current asset will be [WBUT 2018]

- a) Rs. 1,76,000
- b) Rs. 1,34,000
- c) Rs. 1,60,000
- d) Rs. 1,72,000

Answer: (a)

9. Goodwill is a [WBUT 2018]

- a) Fixed asset
- b) Current asset
- c) Fictitious asset
- d) Wasting asset

Answer: (a)

10. Gross Profit is the difference between [WBUT 2019]

- a) Net Sales and Cost of goods sold
- b) Net Sales and Cost of production
- c) Net Sales and Net purchase
- d) Tax and dividend

Answer: (a)

11. Debt to Equity Ratio comes under [WBUT 2019]

- a) Leverage Ratio
- b) Liquidity Ratio
- c) Profitability Ratio
- d) Dividend Ratio

Answer: (a)

12. Current Ratio: 2.5, Current Liabilities: Rs.50000, Acid test Ratio: 1.5

The value of current Assets is –

- a) Rs. 100000
- b) Rs. 125000
- c) Rs.150000
- d) Rs. 175000

Answer: (b)

13. Overhead is the other name of [MODEL QUESTION]

- a) all direct cost
- b) sunk cost
- c) opportunity cost
- d) indirect cost

Answer: (d)

Short Answer Type Questions

1. What is Ratio analysis? Discuss briefly any three ratios (including their formulae). [WBUT 2012]

Answer:

A ratio is an arithmetical relationship between two figures. Financial ratio analysis is a study of ratios between various items or groups of items in financial statements. Financial ratios can be classified into five broad categories – (1) Liquidity ratios, (2) Leverage ratios, (3) Turnover ratios, (4) Profitability ratios, and (5) Valuation ratios.

Liquidity ratios measure the capacity of a firm to meet its short term obligations. Leverage ratios signify the ability of the concern to meet long-term obligations. Turnover ratios measure how efficiently assets are employed by a firm. Profitability ratios signify the profit-earning capacity of business whereas valuation ratios indicate how the equity-stock of the company is assessed in the capital market. Some important ratios are –

a) Current ratio = $\frac{\text{current assets}}{\text{current liabilities}}$, should be ideally 2:1 higher than which indicates existence of idle funds and lesser than which indicates danger of hampering of normal day-to-day operations.

b) Inventory turnover = $\frac{\text{Cost of goods sold}}{\text{Average inventory}}$, high ratio indicates expansion of business

with dangers of overtrading and stock-out whereas low ratio indicates accumulation of slow-moving, non-moving or obsolete stock resulting from inefficient inventory management.

c) Return on capital employed = $\frac{\text{Profit before interest and tax}}{\text{Capital employed}}$

it signified overall efficiency of concern.

2. The following information has been obtained from the records of ABC LTD. from 1st January '13 to 30 June '13.

	1 st Jan' 2013	30 th June'2013
Cost of raw material	60,000	50,000
Cost of work-in-progress	24,000	30,000
Cost of finished goods	1,20,000	1,10,000
Purchase of raw material	9,00,000	
Direct wages	4,60,000	
Factory overhead	1,84,000	
Adm. Overhead	60,000	
Selling & Distribution overhead	40,000	
Sales	18,00,000	

Calculate material consumed, Factory Cost & Total cost.

[WBUT 2013]

Answer:

Cost Sheet for the period from 1st Jan '13 to 30th June '13

Add:	Op. Raw materials	60,000	
Add:	Purchase of Raw materials	9,00,000	
		9,60,000	
Less:	Closing stock of Raw materials	50,000	
		9,10,000	
Add:	Raw Materials Consumed		
Add:	Direct wages	4,60,000	
Add:	Prime Cost	13,70,000	
Add:	Factory Overhead	1,84,000	
		15,54,000	
Add:	Gross Factory Cost		
Add:	Opening Work in Progress	24,000	
		15,78,000	
Less:	Closing Work in Progress	30,000	
		15,48,000	
Net Factory Cost/Cost of goods manufactured			
Add:	Administrative Overhead	60,000	
		16,08,000	
Add:	Cost of goods sold		
		1,20,000	
Add:	Opening stock of Finished goods		

Less:	Closing stock of Finished goods	17,28,000
	Cost of production	1,10,000
Add:	Selling and Distribution Overhead	16,18,000
	Cost of sales (Total Cost)	40,000
	Profit (Balancing figure)	16,58,000
	Sales	1,42,000
		18,00,000

3. If Current Asset = Rs. 8770; Current Liabilities = Rs. 2180; Closing Stock = Rs. 1780, find

- i) Current Ratio
- ii) Acid Test Ratio
- iii) Working Capital.

[WBUT 2015]

Answer:

$$\text{i) Current Ratio} = \frac{\text{Current Asset}}{\text{Current Liability}} = \frac{8,770}{2,180} = 4.023$$

$$\text{ii) Acid Test Ratio} = \frac{\text{Current Asset} - \text{Stock}}{\text{Current Liability}} = \frac{8,770 - 1,780}{2,180} = 3.206$$

$$\text{iii) Working capital} = \text{Current Assets} - \text{Current Liabilities} \\ = 8,770 - 2,180 = 6,590 \text{ Rs.}$$

4. What is ratio analysis? Discuss any three ratios and point out their limitations, if any, for analyzing the financial health of a company.

[WBUT 2018]

Answer:

1st & 2nd part: Refer to Question No. 1 of Short Answer Type Questions.

3rd part:

Ratio Analysis has certain inherent limitations:

- a. Ratios are based upon the figures of financial statements and can be as true as the financial statement figures. In case these figures are window dressed, ratios would not be able to depict an accurate picture of the firm.
- b. Another argument made against ratio analysis is that it uses a management and past information to analyze the firms' performance. It is not properly indicative of the future and this may lead to failure in predicting the future.
- c. Ratio generally vary from industry-to-industry and from situation-to-situation. Various factors lead to a ratio being considered safe or unsafe, the industry, the past profits of the firm, the debt-equity mix. Thus no standard ratio can be said to be ascertainable to which all the firms should adhere to.
- d. Financial statements do not take into account the changes in price levels. Analysis of such statements may not give a true picture of the state of affairs.

5. Define ratio analysis and state advantages of ratio analysis.

[WBUT 2019]

Answer:

1st Part: Refer to Question No. 1 of Short Answer Type Questions.

2nd Part:

When employed correctly, ratio analysis throws light on many problems of the firm and also highlights some positives. Ratios are essentially whistle blowers; they draw the management's attention towards issues needing attention. Let us take a look at some advantages of ratio analysis.

- Ratio analysis will help validate or disprove the **financing, investment and operating decisions** of the firm. They summarize the financial statement into comparative figures, thus helping the **management** to compare and evaluate the financial position of the firm and the results of their decisions.
- It **simplifies complex accounting statements** and financial data into simple ratios of operating efficiency, financial efficiency, **solvency**, long-term positions etc.
- Ratio analysis helps identify problem areas and bring the attention of the management to such areas. Some of the information is lost in the complex accounting statements, and ratios will help **pinpoint such problems**.
- Allows the company to conduct **comparisons with other firms, industry standards, intra-firm comparisons** etc. This will help the organization better understand its fiscal position in the economy.

Long Answer Type Questions

1. a) From the following information, calculate the following:

[WBUT 2013]

- i) **Working Capital**
- ii) **Current Ratio, and**
- iii) **Quick Ratio.**

Balance Sheet Data of ABC Company

	Amount (Rs)
Creditors	30,000
Cash	40,000
Stock	30,000
Debtors	20,000
Prepaid Expenses	10,000
Other Current Liabilities	80,000
Bills Receivable	20,000
Bills Payable	40,000
Outstanding Expenses	5,000
Outstanding Salaries	5,000

Answer:

- i) **Working Capital = [Current Assets – Current Liabilities]**
= [Cash + Stock + Debtors + Prepaid expenses + Bills Receivable]
- [Creditors + other current liabilities + Bills payable]

POPULAR PUBLICATIONS

$$\begin{aligned}
 & + \text{Outstanding expenses} + \text{outstanding salary}] \\
 & = [40000 + 30000 + 20000 + 10000 + 20000] \\
 & \quad - [30000 + 80000 + 40000 + 5000 + 5000] \\
 & = [\text{Rs. } 40,000] \text{ (Negative working capital)}
 \end{aligned}$$

$$\begin{aligned}
 \text{ii) Current Ratio} &= \frac{\text{Current Assets}}{\text{Current Liabilities}} \\
 &= \frac{[40000 + 30000 + 20000 + 10000 + 20000]}{[3000 + 8000 + 40000 + 5000 + 5000]} = \frac{120000}{160000} = 0.74 : 1
 \end{aligned}$$

$$\begin{aligned}
 \text{iii) Quick Ratio} &= \frac{\text{Quick Asset}}{\text{Quick Liabilities}} \\
 &= \frac{\text{CurrentAssets} - \text{Stock} - \text{Prepaid exps}}{\text{Current Liabilities} - \text{BOD}} \\
 &= \frac{12000 - 30000 - 10000}{160000} = \frac{80000}{160000} = 0.5 : 1
 \end{aligned}$$

b) From the following information, prepare an income statement of XYZ Ltd.

	Amount (Rs.)
Sales Revenue	10,00,000
Cost of Goods Sold	4,00,000
Operating Expenses	30,000
Advertisement Expenses	20,000
Salespersons's Salary	30,000
Office and Administrative expenses	30,000
Interest	10,000
Tax	30%

[WBUT 2013]

Answer:

Income Statement for XYZ Ltd.

Particulars	Rs.	Rs.
Sales revenue		10,00,000
Less: Cost of goods sold		4,00,000
		6,00,000
Less: Operating expenses:		
Operating expenses	30,000	
Office & Administrative expenses	30,000	
Advertising expenses	20,000	
Sales person's salary	30,000	
Operating profit	1,10,000	
Less: Non operating expenses & losses(Interest)		4,90,000
		10,000
Profit before tax		4,80,000
Less: Tax (30%)		1,44,000
Net Profit after tax		3,36,000

2. The following is the trial balance of Airdrop Ltd. As on March 31, 2014.

Trial Balance as on March 31, 2014

Particulars	Dr. (Rs.)	Cr. (Rs.)
Share Capital		6,00,000
Stock as on April 1, 2013	40,000	
Sales and Sale returns	80,000	9,60,000
Purchases and purchase returns	6,64,000	84,000
Carriage inward	27,800	
Rent and taxes	12,000	
Sundry creditors		1,16,00
Sundry debtors	2,40,000	
Bank loan (interest at the rate of 12% per annum)		40,000
Interest on bank loan	4,000	
Advertisement Expenses	24,000	
Bad debts	2,000	
Income from investments		4,000
Cash at bank	21,000	
Discount (allowed and received)	4,050	2,800
Investments	40,000	
Furniture and Fittings	45,000	
Audit fees	5,400	
Insurance premium	2,400	
Travelling expenses	2,200	
Cash in hand	5,400	
Salaries	1,37,550	
Wages	50,000	
Building	2,50,000	
Plant and Machinery	1,50,000	
	18,06,800	18,06,800

Additional Information:

- i) Closing Stock as on March 31, 2014 was Rs. 42,500.
- ii) The effect of advertisement being not yet expired. $\frac{1}{4}$ of the amount of advertisement expenses is to be carried forward to the next year.
- iii) Depreciation is to be provided as follows:
 Furniture and fittings – 10%
 Plant and machinery – 20%
 Building – 10%
- iv) Salaries outstanding as on March 31, 2014 were Rs 12,450.
- v) Provide 2% for discount on debtors and create a provision for bad and doubtful debts at 5% on debtors.

After making the necessary adjustments, you are required to prepare

- a) Trading and Profit and Loss account of Airdrop Ltd. for the year ended March 31, 2014
- b) Balance sheet of Airdrop Ltd. as at March 31, 2014.

[WBUT 2014]

POPULAR PUBLICATIONS

Answer:

Trading and Profit and Loss Account for the year ended 31.3.14

Particulars	Rs.	Rs.	Particulars	Rs.	Rs.
To opening stock		40,000	By sales	9,60,000	
To purchase	6,64,000	5,80,000	Less: returns	80,000	8,80,000
Less: returns	84,000	27,800	By closing stock		42,500
To carriage inward		50,000			
To wages		2,24,700			
To gross profit		9,22,500			9,22,500
To interest on Bank loan	(4,000+800)	4,800			
To audit fees		5,400	By gross profit		2,24,700
To rent & taxes		12,000	By Income from investment		4,000
To advertisement		18,000	By discount received		2,800
To bad debts		2,000	By net loss		45,410
To discount allowed		4,050			
To depreciation					
Furniture	4,500				
Building	25,000				
Plant	30,000	59,500			
To salaries		1,50,000			
To Insurance premium		2,400			
To travelling expenses		2,200			
To provision for bad debts		12,000			
To provision for discount on debtors		4,560			
		2,76,910			2,76,910

Balance Sheet as at 31.3.2014

Particulars	Rs.	Rs.	Particulars	Rs.	Rs.
Share Capital		6,00,000	Furniture & fittings	45,000	
			Less: Depreciation	4,500	40,500
			Building (2,50,000–25,000)		2,25,000
			Plant & Machinery (1,50,000–30,000)		1,20,000
			Investment		40,000
Sundry creditors		1,16,000	Sundry Debtors	2,40,000	
Bank Loan	40,000		Provision for bad debts	(12,000)	
Add: Interest outstanding	800	40,800	Provision for discount	(4,560)	
Salaries					2,23,440

ECONOMICS FOR ENGINEERS

outstanding		12,450	Cash in hand Advertisement Expenditure yet to be written off Cash at Bank Closing stock Profit & Loss A/c(net loss)		5,400 6,000 21,000 42,500 45,410
		7,69,250			7,69,250

3. a) Define Ledger and Balance Sheet and elaborate their role in accounting scenario.
 b) The following trial balance was extracted from the books of ABC. Inc as on 30th September, 2016.

	Dr (Rs.)	Cr (Rs.)
Stock on 11 October, 2015	17,940	
Debtors and creditors	38,480	20,540
Capital account on 1 st October, 2015		53,300
Drawings	15,600	
Bills receivable	10,010	
Bad debts written off	2,470	
Provision for bad and doubtful debts		2,080
Bills payable		6,110
Wages and salaries	24,960	
Purchases and sales	85,540	1,38,710
Cash at bank	7,540	
Cash in hand	520	
Rent rates and insurance	4,290	
Sales and purchase returns	5,330	3,640
Fixtures and fittings	7,150	
General expenses	2,600	
Discounts	6,760	4,810
	2,29,190	2,29,190

Prepare the Trading and Profit and Loss Account for the year ended 30th September, 2016 together with a consideration the following adjustments:

- i) Stock on 30th September, 2016 was valued at Rs. 18,460
- ii) Increased the provision for bad and doubtful debts to Rs. 2,730
- iii) Rent and rates prepaid at 30th September, 2016 were Rs. 260
- iv) Wages and salaries accrued at 30th September, 2016 were Rs. 390.

[WBUT 2016]

Answer:

a) Ledger is the principal book of accounts where similar transactions relating to a particular person or thing are recorded. As we know a journal records all types of business transactions in chronological order but a business is required to determine the effect of transactions in a transaction. Ledger separates each transaction in a manner that each type of similar transactions is recorded and consolidated in a specified format called the ledger in a particular accounting year. This process of recording transactions from journal to a ledger is called posting.

POPULAR PUBLICATIONS

Balance Sheet

It is a statement of financial position consisting of assets and liabilities of any business enterprise in a particular date. Balance sheet summarises and reveals the financial position on an enterprise. Balance sheet is prepared following few concepts like – Money Measurement Concept, Entity Concept Cost Concept and dual aspect concept. The basic equation followed is, Assets = Liabilities + Owner's Equity

It is a financial statement that summarizes a company's assets, liabilities and shareholders' equity at a specific point in time. These three balance sheet segments give investors an idea as to what the company owns and owes, as well as the amount invested by the shareholders. A condensed statement that shows the financial position of an entity on a specified date (usually the last day of an accounting period).

Among other items of information, a balance sheet states (1) what assets the entity owns, (2) how it paid for them, (3) what it owes (its liabilities), and (4) what is the amount left after satisfying the liabilities. Balance sheet data is based on a fundamental accounting equation (assets = liabilities + owners' equity), and is classified under subheadings such as current assets, fixed assets, current liabilities, Long-term Liabilities.

b) Trading and Profit and Loss Account for the year ended on 30.09.2016

Dr.	Particular	Rs.	Rs.	Particular	Rs.	Rs.	Cr.
	To opening stock		17,940			1,38,710	
	To purchase	85,540				5,330	
	Less: Return	3,640					
	To wages and salaries		81,900				
	Add: Outstanding	24,960					
		390					
	To Gross profit		25,350				
			8,190				
			1,33,380				
	To rent, rate and insurance		4,290				
	Less: Prepaid		260				
	To General expenses		4,030				
	To provision for bad and doubtful debts		2,600				
			2,080				
	Add: Provision made during year		650				
	To discount allowed		2,730				
			6,760				
	To bad debts written off		2,470				
			5,590				
	To Net profit		13,000				

4. From the following information prepare a statement of cost for the month of July 2015.

	Rs.
Opening stock of Raw Material	18,000
Opening stock of Finished Goods	5,000
Closing stock of Raw Material	10,000
Closing stock of Finished Goods	6,000
Purchase of Raw Material	90,000
Direct Wages	18,000
Factory supervision	5,000
Depreciation on Plant and Machinery	12,000
Office Salary	14,000
Salesman's Salaries	6,000
Sales	1,70,000

[WBUT 2016]

Answer:

Statement of cost for the month of July, 2015

Particular	Rs.	Rs.
Direct Material	90,000	90,000
Opening stock	18,000	
Add: Purchase	90,000	
		1,08,000
Less: Closing stock	10,000	98,000
Direct wages		18,000
Prime cost		1,16,000
Add: Factory overhead		
Factory supervision	5,000	
Depreciation on plant & machine	12,000	
Factory cost		17,000
Overhead		1,33,000
		14,000
Add: Opening stock of finished goods		1,47,000
		5,000
Less: Closing stock of finished goods		1,52,000
Cost of goods sold		6,000
Add: Selling & Distribution overhead		
Salesman's salaries		6,000
Cost of sales / Total cost		1,52,000
Add: Profit		18,000
Sales		1,70,000

5. The income statement of Vignesh Ltd. is as follows:

[WBUT 2017]

	Rs.		Rs.
To Opening Stock	2,00,000	By Sales	13,00,000
To Purchases	8,00,000		
To Direct expenses	1,00,000		
Gross Profit	2,00,000		
			13,00,000

POPULAR PUBLICATIONS

To Admin. Expenses	1,00,000	By Gross profit	2,00,000
To selling expenses	80,000	Profit on sale of investment	60,000
To non-operating expenses	40,000	Dividend received	40,000
Net profit	80,000		
	3,00,000		3,00,000

Calculate the Gross Profit Ratio, Net Profit Ratio, Operating Ratio, Operating Profit Ratio, and Expense Ratio.

Answer:

$$\text{Gross profit ratio} = \frac{\text{Gross profit}}{\text{Sales} - \text{Sales return}} \times 100 = \frac{2,00,000}{13,00,000 - \text{nil}} \times 100 = 15.385\%$$

$$\text{Net Profit ratio} = \frac{\text{Net profit}}{\text{Net sales}} \times 100 = \frac{20,000}{13,00,000} \times 100 = 6.154\%$$

Operating profit ratio

$$= \frac{\text{Gross profit} - \text{Admin. Expense} - \text{Selling Expense}}{\text{Net sales}} \times 100$$

$$= \frac{2,00,000 - 1,00,000 - 80,000}{13,00,000} \times 100 = 1.538\%$$

Expense ratio

$$= \frac{\text{Cost of goods sold} + \text{Admin-Expense} + \text{selling} + \text{Non-operating expense}}{\text{Sales}}$$

$$= \frac{(8,00,000 + 1,00,000 + 2,00,000) + 1,00,000 + 80,000 + 40,000}{13,00,000}$$

$$= \frac{13,20,000}{13,00,000} \times 100 = 101.538\%$$

$$\text{Operating Ratio} = \frac{\text{Cost of goods sold} + \text{Admin. Exp.} + \text{Selling}}{\text{Net sales}}$$

$$= \frac{11,00,000 + 1,00,000 + 80,000}{13,00,000} \times 100 = 98.462\%$$

6. a) Define Dual aspect concept in Financial Accounts.

[WBUT 2018]

Answer:

Dual Aspect Concept The foundation of accounting is transactions and events. Modern financial accounting recognizes and records two aspects for every transaction or event. This is known as dual aspect or duality of a transaction. The system of maintenance of books based on duality is known as double entry system. For example, when capital is invested in the business by the proprietor, in recognition of the concept of separate entity, the business treats the same as a liability. The result of such transaction is the increase in liability of the entity on one hand, and the increase in the cash of the business on other hand. Thus, the introduction of capital has a two-fold effect. Similarly, when loan is raised from outside sources, the two aspects of the event are the increase in the outside

liability and the increase in the cash (assets) of the business. In accounting terminology, the resources of the business are termed as 'assets', the obligations of the business to outsiders is termed as 'liabilities' and the obligation of the business towards the owners is termed as 'capital' or 'Equity'. The result of the duality concept, at any point of time, is that the sum of the assets of the business equals the sum of the liabilities and capital of the business. Thus, the duality or accounting equivalence concept implies that: Owners' Equity + Outside Liability = Assets. This equation is also known as the 'Fundamental Accounting equation'. We shall see that the entire mechanics of Financial Accounting revolves around this equation.

b) The following is the Trial Balance of Durga Industries Ltd. as on 31st March, 2018 and other information. Prepare a Trading and Profit and Loss Account for the year ended 31st March, 2018 and a Balance Sheet as on 31st March, 2018.

Trial Balance of Durga Industries Ltd. as on 31st March, 2018

Dr.			Cr.
Particulars	Rs.	Particulars	Rs.
Investment	35,000	Share Capital	4,00,000
Calls on arrear	1,000	Sales	3,00,000
Land & Building	45,000	Sundry Creditors	17,000
Machinery	3,00,000	General Reserve	25,000
Furniture	15,000	Profit on consignment	13,000
Customs Duty	3,800	Loan from Bank	45,000
Wages	31,400	Dividend	3,000
Salaries	45,200		
Insurance	2,800		
Purchase	1,60,000		
Bills Receivable	21,200		
General Expenses	6,900		
Sundry Debtor	60,000		
Opening Inventory	65,000		
Cash at bank	8,800		
Cash in hand	900		
Director's fees	1,000		
	8,03,000		8,03,000

The following further information is to be taken into consideration:

- i) Closing Inventory Rs. 86,000
- ii) Depreciate Machinery at 10%
- iii) Outstanding Salary Rs. 4,000
- iv) Transfer Rs. 5,000 to General Reserve
- v) The authorized capital of the company is Rs. 6,00,000 divided into Equity Shares of Rs. 10 each
- vi) Provision for income tax @ 30%

[WBUT 2018]

POPULAR PUBLICATIONS

Answer:

Durga Industries Ltd.

Trading and Profit & Loss A/c for the year ended 31st March, 2018

Dr	Cr
To Opening stock	65,000
To Purchase	1,60,000
To Wages	31,400
To Salaries 45,200	
Add: outstanding 4,000	49,200
To Customs duty	3,800
To Insurance	2,800
To General expenses	6,900
To depreciation on machinery	3,000
To Net profit	79,900
	3,22,100
To General Reserve	5,000
To Director's fees	1,000
To tax provision	23970
To balance c/d 49930	79,900
	402,000
	79,900
	79,900

Balance Sheet as at 31/03/2018

Liabilities	Rs.	Assets	Rs.
Share capital		Machinery 3,00,000	
Authorised: 60,000 equity shares of Rs.10 each	6,00,000	Less: Depreciation 3,000	2,97,000
Issued & subscribed		Land & Building 45,000	
40,000 shares of Rs.10	4,00,000	Furniture 15000	
Less calls on arrear	1,000	Investment 35,000	
	3,99,000	Closing stock 86,000	
General Reserve	30000	Sundry debtors 60,000	
Profit & loss a/c	49930	Bills Receivable 21,200	
Sundry creditors	17,000	Cash at Bank 8,800	
Provision for tax	23970	Cash in Hand 900	
Total Liabilities	568900		568900
Outstanding salaries	4,000		
Loan from Bank	45,000		

7. Write short notes on the following:

- a) **Balance Sheet** [WBUT 2012, 2017]
- b) **Cost Accounting** [WBUT 2014]
- c) **Significance of cost accounting** [WBUT 2015]
- d) **Current asset and fixed asset** [WBUT 2016]

Answer:

a) Balance Sheet:

Balance sheet which is also known as position statement is part of final accounts, i.e., final summary of the entire accounting system, along with the income statement or profit and loss account. The balance sheet of a firm displays the net asset position of the concern at the end date of the accounting period depicting, as far as possible, the financial position or financial state of affairs of the concern on the accounts closure date.

The Balance Sheet of an Indian company must be prepared following the part I of schedule VI of the Indian companies Act, 1956 either in horizontal form or in vertical form preferably. The presentation represents on one side, the sources from which the funds of the firm have been obtained, i.e., capital and liabilities and, on the other side, the ways in which such funds have been used, i.e., Assets.

Balance Sheet is a very important tool of financial statement to the both internal user i.e., internal management and external users, i.e., creditors, investors and shareholders, lenders etc. but it is a static statement and fails to exhibit the current values and is affected by accounting policies such as stock-valuation, depreciation of assets etc.

b) Cost Accounting:

Cost Accounting involves classification and analysis of costs on the basis of functions, processes, products, centers etc. It also deals with cost computation, cost saving, cost reduction, etc. cost accounting classifies, records, presents and interprets in a significant manner the material, labour and overhead costs involved in manufacturing and selling each product or each job or rendering a service.

The information generated under the cost accounting system is used by members of management at different levels. The data under cost accounting may be gathered for small or large segments or activities or an organization and monetary as well as other measures can be used for different activities in the firm. Cost accounting applies any measurement unit that is useful in a particular situation. Besides the monetary units, the cost accountant may find it necessary to use such measures as labour hours, machine hours and product units for the purpose of analysis and decision making. It can use any accounting technique or practice which generates useful information.

c) Significance of cost accounting:

Cost Accounting is a system used to record, summarize and report cost information. Cost information is presented in the form of special reports to the internal users, such as managers in the company, which is used in "deciding how to operate the organization". These "decisions" are simply the choices managers make about how their organizations should do things. Some cost information, is provided to external users, such as shareholders and creditors as part of the financial statements). Thus, cost accounting

POPULAR PUBLICATIONS

involves the accumulation, recording and reporting of costs and other quantitative data. The information generated by the Cost Accounting system is used by an organization for internal purposes and for external purposes. Providing cost information to managers (internal purposes) to assist them in decision-making is called **Management Accounting**.

d) Current asset and fixed asset:

Current assets are balance sheet accounts that represent the value of all assets that can reasonably expect to be converted into cash within one year. Current assets include cash and cash equivalents, accounts receivable, inventory, marketable securities, prepaid expenses and other liquid assets that can be readily converted to cash.

In the United Kingdom, current assets are also known as current accounts.

BREAKING DOWN 'Current Assets'

Current assets are important to businesses because they can be used to fund day-to-day operations and pay ongoing expenses. Depending on the nature of the business, current assets can range from barrels of crude oil, to baked goods, to foreign currency. On a balance sheet, current assets will normally be displayed in order of liquidity, or the ease with which they can be turned into cash.

A fixed asset is a long-term tangible piece of property that a firm owns and uses in the production of its income and is not expected to be consumed or converted into cash any sooner than at least one year's time.

Examples of Fixed Assets

Fixed assets can include buildings, computer equipment, software, furniture, land, machinery and vehicles. For example, if a company sells produce, its delivery trucks are fixed assets. If a business creates a company parking lot, the parking lot is a fixed asset.

QUESTION 2015**GROUP - A**
(Multiple Choice Type Questions)

1. Answer any ten questions:

i) Contribution margin is the

- ✓ a) excess of sale price over variable costs
- b) excess of sale price over fixed costs
- c) excess of sale price over both variable and fixed costs
- d) none of these

ii) The firm's decision to invest its funds in fixed and long term assets is known as

- a) Assets Planning
- ✓ b) Capital Budgeting
- c) Long Term Budgeting
- d) Short Term Budgeting

iii) Which of the following balance appears on the debit side of the Trial Balance?

- a) A loss
- b) An expenditure
- c) An Asset
- ✓ d) All of these

iv) In Double Entry System of Book Keeping every business transaction affects

- ✓ a) two accounts
- b) two sides of same account
- c) the same account on two different dates
- d) all of these

v) In this method we start with the higher rate of depreciation in the first year of the life of the assets ad reduce this rate in succeeding periods till its year of salvage.

- a) Straight line method
- b) Reducing balance method
- ✓ c) Sum of the years digit method
- d) Sinking fund method

vi) Annualized capital recovery cost is defined as

- a) $C(A/P, i, n) + S(A/F, i, n)$
- b) $-C(A/P, i, n) + S(A/F, i, n)$
- c) $-C(A/P, i, n) - S(A/F, i, n)$
- ✓ d) $C(A/P, i, n) - S(A/F, i, n)$

vii) A numerical description of the outcome of an experiment is called a

- a) Descriptive statistic
- ✓ b) Probability Function
- c) Variance
- d) Random Variable

viii) The example of Replacement problem is

- a) Obsolescence
- b) Depletion
- c) Deterioration due to aging
- ✓ d) All of these

ix) What is the full form of PVIF?

- a) Present Value Income Factor
- ✓ b) Present Value Interest Factor
- c) Profit Value Income factor
- d) None of these

POPULAR PUBLICATIONS

- x) If actual sales are Rs. 40,000 and BEP sales are Rs. 30,000, the Margin of Safety is Rs.
 a) 70,000 ✓b) 10,000 c) 1,40,000 d) 15,000

- xi) $FVIF_{5\%,3} =$
 a) 1.050 b) 1.103 ✓c) 1.158 d) 1.216

- xii) In Replacement Analysis, the existing asset which is considered for replacement is called asset.
 a) challenger b) striker c) winger ✓d) defender

GROUP – B

(Short Answer Type Questions)

2. Assuming that the cost structure and selling price remain same in 2014 and 2015, find out

- P/V ratio;
- Break Even point of sales;
- Profit when sales are of Rs. 3,00,000;
- Sales required to earn a profit of Rs. 60,000 and
- Margin of safety in 2015

Period	Sales (Rs.)	Profit (Rs.)
2014	3,60,000	27,000
2015	4,20,000	39,000

See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Short Answer Type Question No. 2.

3. Distinguish between Depreciation and Obsolescence.

Solve:

A company purchased a machine on 1st April 2012 for Rs. 2,60,000; Shipping and forwarding charges: Rs. 10,000; Import duty: Rs. 12,000; Installation charges: Rs. 10,000; Depreciation is to be charged under diminishing balance method at

1st year – 10% p.a.; 2nd year – 20% p.a., 3rd year – 30% p.a.

Calculate the amount of depreciation each year.

See Topic: DEPRECIATION, Short Answer Type Question No. 2.

4. a) Define IRR (Internal Rate of Return).

b) What is the present value of the following cash flow, assuming a discount rate of 8%?

Year	Cash flow
1	30000
2	20000
3	10000
4	10000

See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Short Answer Type Question No. 3.

See Topic: PRESENT WORTH ANALYSIS, Short Answer Type Question No. 6.

5. Write a short note on recurring and nonrecurring cost.

See Topic: ENGINEERING COSTS & ESTIMATION, Short Answer Type Question No. 3.

6. a) What is the significance of Profit-Volume ratio?

b) Calculate price of a product from the following information:

Profit Volume ratio is 30%

Variable cost of the product is Rs. 140/-

See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Short Answer Type Question No. 4.

GROUP - C

(Long Answer Type Questions)

7. a) Distinguish between Marginal Cost and Average Cost. Draw both the graphs in a single graph paper.

b) If $C(x) = x^3 + 5x^2 + 3x + 500$, find

- i) Fixed Cost
- ii) Variable cost
- iii) Average Cost
- iv) Marginal Cost
- v) Average Variable Cost

See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 3(a) & (b).

c). Box I contains 6 white and 4 black balls and Box II contains 5 white and 5 black balls. A box is selected at random and a ball is selected from the box. If for Box I, a person receives Rs. 2 and Box II pays Re. 1 and for each white ball the person gives Rs. 5 and for every black ball a person receives Rs. 8, find the expected gain.

See Topic: UNCERTAINTY IN FUTURE EVENTS, Long Answer Type Question No. 5.

8. a) A company is currently working with a process, which after paying for materials, labor etc. brings a profit of Rs. 12,000. The company has the following alternatives:

- i) The company can conduct research R_1 which is expected to cost Rs. 10,000 and having 90% probability of success. If successful, the gross income will be Rs. 26,000.
- ii) The company can conduct research R_2 which is expected to cost Rs. 6,000 and having 60% probability of success. If successful, the gross income will be Rs. 24,000.
- iii) The company can pay Rs. 5,000 as royalty of a new process. If will bring a gross income of Rs. 20,000.

Because of limited resources, only one of the two types of research can be carried out at a time. Draw the decision tree and find the optimal strategy for the company.

See Topic: UNCERTAINTY IN FUTURE EVENTS, Long Answer Type Question No. 6.

b) Explain the concept of 'Break-even' analysis.

See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Short Answer Type Question No. 5.

9. a) If Current Asset = Rs. 8770; Current Liabilities = Rs. 2180; Closing Stock = Rs. 1780, find

i) Current Ratio

ii) Acid Test Ratio

iii) Working Capital

See Topic: ACCOUNTING, Short Answer Type Question No. 3.

POPULAR PUBLICATIONS

b) Initial Cost = Rs. 60,000

Year	1	2	3	4	5
Resale Value	42,000	30,000	20,400	14,400	9,650
Maintenance Cost	18,000	20,270	22,880	26,700	31,800

Find the year in which the machine would be replaced.

See Topic: REPLACEMENT ANALYSIS, Long Answer Type Question No. 1.

10. Explain the types of estimate. What are the difficulties in estimation? What do you mean by Cost Index?

See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 4.

11. Write short notes on any three of the following:

- a) Relevance of Capital budgeting
- b) Sunk cost and variable cost
- c) Causes and effects of inflation
- d) Significance of cost accounting
- e) Sensitivity analysis

a) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(b).

b) See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 8(c).

c) See Topic: INFLATION AND PRICE CHANGE, Long Answer Type Question No. 3(d).

d) See Topic: ACCOUNTING, Long Answer Type Question No. 7(c).

e) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(c).

QUESTION 2016

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

i) Accounting Equation is

- a) Capital = Assets – Liabilities
- b) Liabilities = Capital – Assets
- c) Assets = Capital – Liabilities
- d) none of these

ii) A person if deposits Rs. 50,000 in a bank at an interest of 10% compounded annually, then the future value at the end of 5 years will be

- a) 80,525
- b) 70,525
- c) 85,525
- d) 90,525

iii) If in a power sizing model the power sizing index is greater than 1, then

- a) Per unit price increases with increase in quantity
- b) Per unit price decreases with increase in quantity
- c) Per unit price remains constant with increase in quantity
- d) Per unit price remains constant with decrease in quantity

- iv) If A and B are two independent events then it can be expressed as
 a) $P(A \cup B)$ b) $P(A \times B)$ ✓c) $P(A) \times P(B)$ d) none of these
- v) Which are the determinants of economic life of an asset?
 a) Capital recovery cost b) Average operating and maintenance cost
 c) Sum of capital recovery cost ✓d) all of these
- vi) What is the relation between the slopes of Total Cost (TC) and Total Revenue (TR) curves?
 a) Slope of TR > Slope of TC b) Slope of TR < Slope of TC
 c) Slope of TR = Slope of TC ✓d) No fixed relation
- vii) A portion of the learning curve is
 a) Parallel to y axis b) Parallel to x axis
 ✓c) Cuts the x axis d) Cuts the y axis
- viii) If the inflation rate is 6% per year and the market interest rate is known to be 15% per year, what is the implied real interest rate in this inflationary economy?
 a) 11.45% b) 9.00% ✓c) 8.49% d) 8%
- ix) Sunk cost is
 a) Original investment + depreciation – repairing expenses
 b) Original investment – depreciation + repairing expenses
 ✓c) Original investment + depreciation + repairing expenses.
 d) Original investment – depreciation – repairing expenses
- x) Which of the following is not applicable to bottom-up approach to cost estimation?
 ✓a) The project under consideration is considered at the highest aggregate level
 b) The project under consideration is split into smaller parts and their respective components are identified
 c) Cost estimates are made for each component of each small part and added up
 d) Cost estimates are made for each component of each part of the project and are added up to arrive at the total
- xi) A deposit of Rs. 1,10,000 was made for 31 days. The net interest after deducting 20% withholding tax is Rs. 890.36. Find the rate of return annually.
 a) 12.25 b) 12.75 c) 11.75 ✓d) 11.95
- xii) If Index Number for a certain period is equal to 100, then
 a) Price are increasing b) Prices are decreasing
 ✓c) Prices remain constant d) Change in prices cannot be predicted

POPULAR PUBLICATIONS

GROUP - B

(Short Answer Type Questions)

2. An aqueduct is needed to bring water into the city. It can be built at a reduced size now for Rs. 3 lakh and enlarged 25 years later at Rs. 3.5 lakh. The other option is to construct the full size aqueduct now for Rs. 4 lakh. Use present worth to find the better choice.
[Given, $i = 6\%$ and $(P/F, 6\%, 25) = 0.2330$]

See Topic: **UNCERTAINTY IN FUTURE EVENTS**, Short Answer Type Question No. 1.

3. Define time value of money. Discuss its importance.

See Topic: **CASH FLOW, INTEREST AND EQUIVALENCE**, Short Answer Type Question No. 5.

4. Define Break-even point. Represent the elements diagrammatically and derive the BEP and BEP sales algebraically.

See Topic: **CASH FLOW & RATE OF RETURN ANALYSIS**, Short Answer Type Question No. 6.

5. a) What is Estimation?
 b) An Electricity company wants to replace its Machinery which was erected in the year 1982 at a cost of Rs. 15,00,000 with a capacity of 300 MW. This consists of material, labour and overhead in the ratio of 5 : 3 : 2. The present cost index of material, labour and overheads are 250, 300 and 240 respectively. The company wants to increase double of its present capacity. You are required to determine the present cost of Machinery to be replaced with double capacity by using cost indexes and power-sizing model. The power sizing factor is 0.90.

See Topic: **ENGINEERING COSTS & ESTIMATION**, Short Answer Type Question No. 4.

6. Discuss the causes of inflation.

See Topic: **INFLATION AND PRICE CHANGE**, Short Answer Type Question No. 2.

GROUP - C

(Long Answer Type Questions)

7. a) Define Decision Tree. Explain the different steps of making Decision Tree.
 See Topic: **UNCERTAINTY IN FUTURE EVENTS**, Long Answer Type Question No. 7.

- b) From the following information prepare a statement of cost for the month of July 2015.

	Rs.
Opening stock of Raw Material	18,000
Opening stock of Finished Goods	5,000
Closing stock of Raw Material	10,000
Closing stock of Finished Goods	6,000
Purchase of Raw Material	90,000
Direct Wages	18,000
Factory supervision	5,000
Depreciation on Plant and Machinery	12,000
Office Salary	14,000
Salesman's Salaries	6,000
Sales	1,70,000

See Topic: ACCOUNTING, Long Answer Type Question No. 4.

8. a) Differentiate between Risk and Return. Explain the role of sensitivity analysis in this context.
 b) ABC Ltd. is considering an investment proposal whose initial outlay is Rs. 100,000. Project life will be 4 years. Other estimates are:

Annual sales volume: 10,000 units

Fixed cost per annum: Rs. 26,00

Contribution per units: Rs. 6

Cost of capital: 8%

Present value of Rs. 1 payable or receivable annually at the end of 4 years at 8% : 3.3121.

- Find Net Present Value of the project
- By how much can each factor change before ABC Ltd. becomes indifferent to the project?
- Comment on the sensitivity of the factors based on your answers in (ii).

a) See Topic: UNCERTAINTY IN FUTURE EVENTS, Short Answer Type Question No. 4.

b) See Topic: PRESENT WORTH ANALYSIS, Long Answer Type Question No. 2.

9. a) Define Ledger and Balance Sheet and elaborate their role in accounting scenario.

- b) The following trial balance was extracted from the books of ABC. Inc as on 30th September, 2016.

	Dr (Rs.)	Cr (Rs.)
Stock on 11 October, 2015	17,940	
Debtors and creditors	38,480	20,540
Capital account on 1 st October, 2015		53,300
Drawings	15,600	
Bills receivable	10,010	
Bad debts written off	2,470	
Provision for bad and doubtful debts		2,080
Bills payable		6,110
Wages and salaries	24,960	
Purchases and sales	85,540	1,38,710
Cash at bank	7,540	
Cash in hand	520	
Rent rates and insurance	4,290	
Sales and purchase returns	5,330	3,640
Fixtures and fittings	7,150	
General expenses	2,600	
Discounts	6,760	4,810
	2,29,190	2,29,190

Prepare the Trading and Profit and Loss Account for the year ended 30th September, 2016 together with a consideration the following adjustments:

- Stock on 30th September, 2016 was valued at Rs. 18,460
- Increased the provision for bad and doubtful debts to Rs. 2,730
- Rent and rates prepaid at 30th September, 2016 were Rs. 260
- Wages and salaries accrued at 30th September, 2016 were Rs. 390.

See Topic: ACCOUNTING, Long Answer Type Question No. 3(a) & (b).

POPULAR PUBLICATIONS

10. a) Describe different areas of management decision.
b) Dimpy Co., a radio manufacturing company finds that the existing cost of a component, Z 200, is Rs. 6.25. The same component is available in the market at Rs. 5.75 each, with an assurance of continued supply.

The breakup of the existing cost of the component is:

	Rs.
Materials	2.75 each
Labour	1.75 each
Other variables	0.50 each
Depreciation and other Fixed cost	<u>1.25</u> each
	<u>6.25</u>

- i) Should the company make or buy? Present the case, when the firm cannot utilize the capacity elsewhere, profitably and when the capacity can be utilized, profitably.

- ii) What would be your decision, if the supplier has offered the component at Rs. 4.50 each

See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 5(a) & (b).

11. Write short notes on any three of the following:

- a) Cost push vs. Demand pull inflation
- b) NPV vs. IRR
- c) Current asset and fixed asset
- d) Conditional probability
- e) Segmenting Model

a) See Topic: INFLATION AND PRICE CHANGE, Long Answer Type Question No. 3(c).

b) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(d).

c) See Topic: ACCOUNTING, Long Answer Type Question No. 7(d).

d) See Topic: UNCERTAINTY IN FUTURE EVENTS, Long Answer Type Question No. 10(c).

e) See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 8(d).

QUESTION 2017

GROUP - A **(Multiple Choice Type Questions)**

1. Choose the correct alternatives for any ten of the following:

- i) Cost reflected in accounting system only is called

- a) Cash cost
- b) Overhead cost
- c) Book cost
- d) Direct cost

- ii) The opportunity cost of a good is

- a) the time lost in finding it
- b) the quantity of other goods sacrificed to the another unit of that good
- c) the expenditure on the good
- d) the loss of interest in using saving

iii) Which one is the right Accounting Equation?

- a) Assets – Liabilities = Capital
- b) Assets + Liabilities = Capital
- c) Assets + Capital = Liabilities
- d) None of these

iv) Inflation makes

- a) future rupees less valuable than present rupees
- b) future rupees more valuable than present rupees
- c) future rupees equal to present rupees
- d) none of these

v) If A and B are two independent events then $P(A \text{ and } B)$ is

- a) $P(A) \times P(B)$
- b) $P(A) + P(B)$
- c) $P(A)/P(B)$
- d) $P(A) - P(B)$

vi) To compute the construction cost per square foot of a building

- a) per unit model will be used
- b) segmenting model will be used
- c) learning curve estimation process will be used
- d) none of these

vii) Which one is fixed cost?

- a) Depreciation of fixed assets
- b) Excise duty
- c) Cost of advertising
- d) Sales tax

viii) Which one of the following is helpful for measuring inflation?

- a) Learning curve
- b) Segmentation model
- c) Consumer price index
- d) MARR (Minimum Attractive Rate of Return)

ix) In a decision tree arrows coming out of which node have probabilities?

- a) Decision node
- b) Random node
- c) Both (a) and (b)
- d) None of these

x) The present worth of an alternative is 0. What do we know about the value of the future worth?

- a) $FW < 0$
- b) $FW = 0$
- c) $FW > 0$
- d) Cannot be determined without cash flows

xi) If the inflation rate is 6% per year and the market interest rate is known to be 15% per year, what is the implied real interest rate in this inflationary economy?

- a) 11.45%
- b) 9.00%
- c) 8.49%
- d) 8%

xii) A machine worth Rs. 1,00,000 is purchased by paying Rs. 20,000 down payment and 12 monthly installments of Rs. 8,000 each. The book cost at the time of purchase is

- a) Rs 1,00,000
- b) Rs. 8,000
- c) Rs. 80,000
- d) Rs. 12,000

POPULAR PUBLICATIONS

GROUP – B

(Short Answer Type Questions)

2. What are the different methods of calculating depreciation?

See Topic: **DEPRECIATION**, Short Answer Type Question No. 3.

3. If Rs. 100 is invested at a compound interest @ 10% p.a. for 3 years, what will be the respective future value for consecutive 3 years?

See Topic: **CASH FLOW, INTEREST AND EQUIVALENCE**, Short Answer Type Question No. 6.

4. What is 'Simulation Model'? How is the same practically applicable in decision making process?

See Topic: **UNCERTAINTY IN FUTURE EVENTS**, Short Answer Type Question No. 5.

5. Define Learning Curve. What are the limitations of Learning Curve?

See Topic: **ENGINEERING COSTS & ESTIMATION**, Short Answer Type Question No. 5.

6. State the concept of Sensitivity Analysis.

See Topic: **CASH FLOW & RATE OF RETURN ANALYSIS**, Short Answer Type Question No. 1.

GROUP – C

(Long Answer Type Questions)

7. The income statement of Vignesh Ltd. is as follows:

	Rs.		Rs.
To Opening Stock	2,00,000	By Sales	13,00,000
To Purchases	8,00,000		
To Direct expenses	1,00,000		
Gross Profit	2,00,000		
	13,00,000		13,00,000
To Admin. Expenses	1,00,000	By Gross profit	2,00,000
To selling expenses	80,000	Profit on sale of investment	60,000
To non-operating expenses	40,000	Dividend received	40,000
Net profit	80,000		
	3,00,000		3,00,000

Calculate the Gross Profit Ratio, Net Profit Ratio, Operating Ratio, Operating Profit Ratio, and Expense Ratio.

See Topic: **ACCOUNTING**, Long Answer Type Question No. 5.

8. a) Differentiate elaborately between Absorption Costing and Marginal costing.

b) Variable cost per unit is Rs. 12, Selling price per unit is Rs. 20. Fixed expenses are Rs. 60,000. Find BEP. What will be the selling price per unit if the BEP is brought down to 6000 units?

See Topic: **ENGINEERING COSTS & ESTIMATION**, Long Answer Type Question No. 6(a) & (b).

9. Explain the importance of Ratio Analysis and Capital budgeting methods in an organization?

See Topic: **CASH FLOW & RATE OF RETURN ANALYSIS**, Long Answer Type Question No. 3.

10. The following details are on the cash flows of two projects A and B:

Year	Project A cash flows (Rs.)	Project B cash flows (Rs.)
0	4,00,000	5,00,000
1	2,00,000	1,00,000
2	1,75,000	2,00,000
3	3,25,000	3,00,000
4	2,00,000	4,00,000
5	1,50,000	2,00,000

Compute PBP , NPV and PI for A and B and suggest which project should be accepted and why?
See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 4.

11. Write short notes on any three of the following:

- a) Balance Sheet
- b) Average Rate of Return (ARR)
- c) Life cycle costing
- d) Power sizing model of cost estimation
- e) Debt repayment

- a) See Topic: ACCOUNTING, Long Answer Type Question No. 7(a).
- b) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(e).
- c) See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 8(b).
- d) See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 8(a).
- e) See Topic: CASH FLOW, INTEREST & EQUIVALENCE, Long Answer Type Question No. 1(a).

QUESTION 2018

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

- i) What is true about the relationship between AC and MC?
 - a) AC cuts MC from below
 - b) MC cuts AC from below
 - c) MC and AC do not cut each other
 - d) AC equals MC when AC is at its maximum
- ii) If Current Ratio is 2.2 and Current Liability is Rs. 80,000 then the amount of current asset will be
 - a) Rs. 1,76,000
 - b) Rs. 1,34,000
 - c) Rs. 1,60,000
 - d) Rs. 1,72,000
- iii) In replacement analysis old machines are known as
 - a) Defender
 - b) Challenger
 - c) Both (a) and (b)
 - d) None of these
- iv) At Break-even point
 - a) Total revenue = Total Cost
 - b) Total revenue = Total Fixed Cost
 - c) Total revenue = Total Variable Cost
 - d) All of the above

POPULAR PUBLICATIONS

- v) Demand-pull inflation may be caused by
a) An increase in costs
 c) A reduction in interest rates
b) A reduction in government spending
d) An outward shift in aggregate supply
- vi) Goodwill is a
 a) Fixed asset b) Current asset
c) Fictitious asset d) Wasting asset
- vii) A large angle of incidence indicates
a) A low rate of profit
c) No profit, no loss
 b) A high rate of profit
d) None of the above
- viii) A card is drawn from a deck of 52 cards. Find the probability that it is either a red king or a black queen.
a) $2/13$ b) $1/13$ c) $5/13$ d) $8/13$
- ix) IRR stands for the rate of return for which
 a) $NPV = 0$ b) $NPV = 1$
c) $NPV = -1$ d) NPV is maximum
- x) The present value of ` 1 to be received after 3 years compounded annually at 10%
a) 0.909 b) 0.826 c) 0.751 d) None of these
- xi) A uniform series of payment occurring at equal interval of time is called _____.
 a) Annuity b) Amortization c) Depreciation d) Bond
- xii) The following value(s) of the Power-Sizing Exponent (E) indicates Economies of scale
 a) $0 < E < 1$ b) $E > 1$ c) $E = 0$ d) $E = 1$

GROUP – B (Short Answer Type Questions)

2. An asset purchased at Rs. 17,000 has a life time of 5 years and salvage value of Rs. 2,000. If depreciation is computed using straight line method, calculate the book value of the asset at the end of 3 years.

See Topic: DEPRECIATION, Short Answer Type Question No. 4.

3. An aqueduct is needed to bring water into the city. It can be built at a reduced size now for Rs. 3 lakhs and enlarged 25 years later at Rs. 3.5 lakhs. The other option is to construct the full size aqueduct for Rs. 4 lakhs. Use Present Worth to find the better choice. [Given $i = 6\%$].

See Topic: UNCERTAINTY IN FUTURE EVENTS, Short Answer Type Question No. 1.

4. A box contains 6 white and 4 black balls. Two balls are drawn at random one after another without replacement. Prepare the joint probability distribution table.

See Topic: UNCERTAINTY IN FUTURE EVENTS, Short Answer Type Question No. 6.

5. Discuss the economic problems faced by an engineer with suitable examples.

See Topic: ECONOMIC DECISION MAKING, Short Answer Type Question No. 1.

6. What is ratio analysis? Discuss any three ratios and point out their limitations, if any, for analyzing the financial health of a company.

See Topic: ACCOUNTING, Short Answer Type Question No. 4.

GROUP – C
(Long Answer Type Questions)

7. a) What do you understand by replacement analysis? Explain 'Economic life' of an asset.

See Topic: REPLACEMENT ANALYSIS, Long Answer Type Question No. 2(a).

b) A firm has purchased an equipment at Rs. 20,000. When should the asset be replaced, if the following is given.

End of year	Operation cost in (Rs.)	Maintenance cost in (Rs.)	Resale value in (Rs.)
1	2,000	200	10,000
2	3,000	300	9,000
3	4,000	400	8,000
4	5,000	500	7,000
5	6,000	600	6,000
6	7,000	700	5,000
7	8,000	800	4,000
8	9,000	900	3,000
9	10,000	1,000	2,000
10	11,000	1,100	1,000

See Topic: REPLACEMENT ANALYSIS, Long Answer Type Question No. 2(b).

8. ABC Toys Pvt. Ltd. is considering the addition of a new toy to its existing product line. Three alternative courses of action are available:

a) Work overtime to meet the demand of the new toy. Overtime expenses are estimated at Rs. 20,000 per month

b) Install new equipment for which fixed expenses per month are expected at Rs. 80,000

c) Lease (rent) a machine at the rate of Rs. 35,000 per month

Variable cost associated with the above three alternatives are Rs. 9, Rs. 7, Rs. 8 respectively. The price per unit of the toy, which is independent of the manufacturing alternative, is fixed at Rs. 15. The expected demand for the toy is given below:

10000 pieces with the probability of 0.5

20000 pieces with the probability of 0.3

50000 pieces with the probability of 0.2

Which alternative should the company adopt to manufacture the toy? Use decision tree.

See Topic: UNCERTAINTY IN FUTURE EVENTS, Long Answer Type Question No. 8.

POPULAR PUBLICATIONS

9. a) What are the causes of inflation?
b) A company is planning to start an employee welfare fund. It needs Rs. 50,00,000 during the first year and it increases by Rs. 5,00,000 every year thereafter up to the end of the 5th year. The above figures are in terms of today's rupee value. The annual average rate of inflation is 6% for the next five years. The interest rate is 18%, compounded annually. Find the single deposit which will provide the required series of fund towards employee's welfare scheme after taking the inflation rate into account.

See Topic: INFLATION AND PRICE CHANGE, Long Answer Type Question No. 2(a) & (b).

10. a) Define Dual aspect concept in Financial Accounts.

See Topic: ACCOUNTING, Long Answer Type Question No. 6(a).

- b) The following is the Trial Balance of Durga Industries Ltd. as on 31st March, 2018 and other information. Prepare a Trading and Profit and Loss Account for the year ended 31st March, 2018 and a Balance Sheet as on 31st march, 2018.

Trial Balance of Durga Industries Ltd. as on 31st March, 2018

Dr.			Cr.
Particulars	Rs.	Particulars	Rs.
Investment	35,000	Share Capital	4,00,000
Calls on arrear	1,000	Sales	3,00,000
Land & Building	45,000	Sundry Creditors	17,000
Machinery	3,00,000	General Reserve	25,000
Furniture	15,000	Profit on consignment	13,000
Customs Duty	3,800	Loan from Bank	45,000
Wages	31,400	Dividend	3,000
Salaries	45,200		
Insurance	2,800		
Purchase	1,60,000		
Bills Receivable	21,200		
General Expenses	6,900		
Sundry Debtor	60,000		
Opening Inventory	65,000		
Cash at bank	8,800		
Cash in hand	900		
Director's fees	1,000		
	8,03,000		8,03,000

The following further information is to be taken into consideration:

- Closing Inventory Rs. 86,000
- Depreciate Machinery at 10%
- Outstanding Salary Rs. 4,000
- Transfer Rs. 5,000 to General Reserve
- The authorized capital of the company is Rs. 6,00,000 divided into Equity Shares of Rs. 10 each
- Provision for income tax @ 30%

See Topic: ACCOUNTING, Long Answer Type Question No. 6(b).

11. Write short notes on any three of the following:

- a) Importance of Break Even analysis
 - b) Difference between NPV and IRR
 - c) Use of price indexes in engineering economic analysis
 - d) Benefit cost ratio
 - e) Types of Inflation
- a) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(f).
- b) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(d).
- c) See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 8(e).
- d) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(a).
- e) See Topic: INFLATION AND PRICE CHANGE, Long Answer Type Question No. 3(e).

QUESTION 2019

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

- i) The opportunity cost of a good is
 - a) The time lost in finding it
 - b) the expenditure on it
 - ✓ c) the quantity of the next best alternative sacrificed to produce one unit of that good
 - d) the amount of savings lost
- ii) If the inflation rate is 7% per year, market interest rate is 15%, then the real interest rate will be
 - ✓ a) 7%
 - b) 10%
 - c) 3%
 - d) 12%
- iii) Gross Profit is the difference between
 - ✓ a) Net Sales and Cost of goods sold
 - b) Net Sales and Cost of production
 - c) Net Sales and Net purchase
 - d) Tax and dividend
- iv) In a decision tree the node with which probability is attached is called
 - a) Decision node
 - ✓ b) Random or Chance node
 - c) Both (a) and (b)
 - d) None of these
- v) Depreciation charged on plant and machinery is
 - a) Discretionary Cost
 - ✓ b) Committed Cost
 - c) Conversion Cost
 - d) Future Cost
- vi) At Break-Even point
 - ✓ a) Total Sales = Total Cost
 - b) Total Revenue = Total Cost
 - c) Total Revenue = Total Fixed Cost
 - d) None of these

POPULAR PUBLICATIONS

- vii) Marginal cost curve cuts the Average Variable cost from
✓ a) Above at its minimum point b) Below at its falling part
c) Below at its minimum point d) None of these
- viii) Debt to Equity Ratio comes under
✓ a) Leverage Ratio b) Liquidity Ratio c) Profitability Ratio d) Dividend Ratio
- ix) Which one of the following is involved to measure inflation
a) Nominal Interest Rate b) MARR
✓ c) Consumer Price Index d) None of these
- x) If A and B are two independent events then $P(A \cap B) =$
a) $P(A/B) \times P(B)$ ✓b) $P(A) \times P(B)$ c) $P(A \cup B)$ d) $P(A) + P(B)$
- xi) To compute the updated cost of a boiler with same capacity in a power plant, we use
a) Per Unit Cost Model ✓b) Cost Index Model
c) Power Sizing Model d) Segmenting Model
- xii) Contribution margin is the
✓ a) excess of sale price over variable cost
b) excess of sale price over fixed cost
c) excess of sale price over both variable cost and fixed cost
d) none of these

GROUP – B

(Short Answer Type Questions)

2. Write a brief note on Per Unit Cost method of estimation.
See Topic: ENGINEERING COSTS & ESTIMATION, Short Answer Type Question No. 6.
3. Distinguish between Consumer Price Index (CPI) and Wholesale Price Index (WPI).
See Topic: INFLATION AND PRICE CHANGE, Short Answer Type Question No. 3.
4. A machine needed for 3 years can be purchased for Rs. 77,662 and sold at the end of period for about Rs. 25,000. A comparable machine can be leased for Rs. 30,000 per year. If a firm expects return of 20% on investments, should it buy or lease the machine? Capital recovery factor (20%, 3 years) = 0.4747. Sinking fund factor (20%, 3 years) = 0.2747).
See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Short Answer Type Question No. 7.
5. Define inflation. What are the causes of inflation?
See Topic: INFLATION AND PRICE CHANGE, Short Answer Type Question No. 4.
6. A student has taken a loan of Rs. 3,00,00 for 3 years at 9% per annum. Calculate how much needs to be repaid at the end of 3 years under compound interest rate.
See Topic: CASH FLOW, INTEREST AND EQUIVALENCE, Short Answer Type Question No. 7.

GROUP - C
(Long Answer Type Questions)

7. A firm whose cost of capital is 10%, considering two mutually exclusive projects X and Y, the details are as follows:

Year	Project A	Project B
0	(70,000)	(7,00,000)
1	10,000	50,000
2	20,000	40,000
3	30,000	20,000
4	45,000	10,000
5	60,000	10,000
Total Cash Flow	1,65,000	1,30,000

Compute NPV, Profitability Index and IRR of the two projects.

See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 5.

8. a) Define Learning curve.

b) Five years ago, when the relevant cost index was 120, a nuclear centrifuge cost \$40,000. The centrifuge had a capacity of separating 1500 gallons of ionized solution per hour. Today, it is desired to build a centrifuge with capacity of 4500 gallons per hour, but the cost index now is 300. Assuming a power-sizing exponent to reflect economies of scale, x , of 0.75, use the power-sizing model to determine the approximate cost (expressed in today's dollars) of the new reactor.

See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 7(a) & (b).

9. a) What is decision tree?

b) Ms. Sameera Goel is the vice president of an 'Oil Company', who is concerned about the plant's current production capability. She has three alternatives. The first alternative would result in significant changes in present operations, including increased automation. The second one involves small changes in plant operation and would not include any new automation. The third alternative is to make no changes (do nothing).

As a member of the plant management you have assigned the task of analyzing the three alternatives and recommending a course of action. The increased cost and increased annual revenue for the first two alternatives are shown below:

Alternative	Increased Cost	Future Sale	Increased Annual Revenue
1	Rs. 3,00,000	Good	Rs. 1,42,000
		Average	Rs. 1,19,000
		Poor	Rs. 50,000
2	Rs. 85,000	Good	Rs. 66,000
		Average	Rs. 46,000
		Poor	Rs. 17,000
3 (Current operation)	0	----	0

The sales department estimates the probability of Good, Average and Poor future sales as 0.30, 0.60 and 0.10 respectively. The rate of interest per year is 20%, study period is 5 years. with help of a decision tree determine which alternative is preferred.

See Topic: UNCERTAINTY IN FUTURE EVENTS, Long Answer Type Question No. 9.

POPULAR PUBLICATIONS

10. a) Define ratio analysis and state advantages of ratio analysis.

See Topic: ACCOUNTING, Short Answer Type Question No. 5.

b) From following information resulting to Intel Limited you are supposed to prepare its summarized balance sheet

- (i) Current Ratio = 2.5
- (ii) Acid Test Ratio = 1.5
- (iii) Gross Profit to Sales = 0.2
- (iv) Net Profit/Working Capital = 0.3
- (v) Sales/ Net Fixed Asset = 2.
- (vi) Sales/ Net Worth = 1.5
- (vii) Sales/ Debtors = 6
- (viii) Reserve/ Capital = 1
- (ix) Net worth/ Long Term Loan = 20
- (x) Stock velocity = 2 months
- (xi) Paid up share capital = \$10,00,000.

Data incomplete

11. Write the short notes on any three of the following:

- a) Break-even Analysis
 - b) Life-cycle costs
 - c) Opportunity costs
 - d) Probability & Joint probability
 - e) Depreciation.
- a) See Topic: CASH FLOW & RATE OF RETURN ANALYSIS, Long Answer Type Question No. 6(g).
- b) See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 8(b).
- c) See Topic: ENGINEERING COSTS & ESTIMATION, Long Answer Type Question No. 8(f).
- d) See Topic: UNCERTAINTY IN FUTURE EVENTS, Long Answer Type Question No. 10(d).
- e) See Topic: DEPRECIATION, Long Answer Type Question No. 1.

