

DHANALAKSHMI COLLEGE OF ENGINEERING, CHENNAI

DEPARTMENT OF MECHANICAL ENGINEERING

MG6863 - ENGINEERING ECONOMICS

UNIT – I: INTRODUCTION TO ECONOMICS

PART – A (2 Marks)

1. **What is elasticity of demand?**

Elasticity of demand may be defined as 'the degree of responsiveness of quantity demanded to a change in price'.

2. **Define the term 'cost'.**

Cost may be defined as a total of all expenses incurred, whether paid or outstanding, in the manufacture and sale of a product.

3. **What is opportunity cost?**

Opportunity cost may be defined as the potential benefit that is given up as an alternative course of action is sought. In other words, the expected return of benefit for gone in rejecting one course of action for another.

4. **What do you mean by marginal cost?**

The Institute of Costs and Works Accountants of India defined marginal cost as, "the amount at any given volume of output by which aggregate costs are changed, if the volume of output is increased or decreased by one unit".

5. **Explain marginal costing?**

Marginal costing is defined by the ICWA as, "the ascertainment by differentiating between fixed costs, and variable costs, of marginal costs and of the effect on profit of changes in volume or type of output".

6. **What is meant by marginal revenue?**

The revenue that can be obtained from selling one more unit of product is called marginal revenue.

7. **Give a short note on sunk cost. (M/J 2012)**

A cost which was incurred or sunk in the past and is not relevant to the particular decision-making is a sunk cost or sunk loss. It may be variable or fixed or both.

8. **List out the elements of cost.** The

elements of cost are

- a. Materials
- b. Labour and
- c. Expenses.

9. Define the term costing.

Institute of Costs and Management Accountants (ICMA), London, has defined costing as the ascertainment costs. "It refers to the techniques and processes of ascertaining costs and studies the principles and rules concerning the determination of cost of products and services".

10. What is breakeven point?

The breakeven point is that volume of output at which neither a profit is made nor a loss is incurred.

It is a point where the total sales are equal to total cost.

11. Write the formula to find P/V ratio.

The formula for computing the P/V ratio is given below.

$$\begin{aligned} \text{P/V ratio} &= \frac{\text{Contribution}}{\text{Sales}} \\ &= \frac{\text{Fixed cost} + \text{Profit}}{\text{Sales}} \quad \text{Or} \\ &= \frac{\text{Sales} - \text{Variable cost}}{\text{Sales}} \quad \text{Or} \end{aligned}$$

12. List out the formulae to find out the margin of safety.

Margin of safety = $\frac{\text{Sales of safety}}{\text{Actual sales}}$

$$\text{Or} = \frac{\text{Profit}}{\text{P/V ratio}}$$

$$\text{Or} = \frac{\text{Contribution}}{\text{Margin of safety}} \times \text{Sales}$$

As $\frac{\text{Margin of safety}}{\text{Total sales}} \times 100 =$ a percentage

13. What is fixed cost?

Fixed cost means that the cost tends to be unaffected with the volume of output. Fixed cost depends upon the passage of time and does not vary directly with the volume of output. It is known as period cost, (e.g) rent and rates of factory buildings, insurance of buildings, depreciation of buildings, etc.

14. Give a short note on variable cost.

Variable cost tends to vary directly with the volume of output. It varies almost in direct proportion to the volume of production, (e.g) the cost of direct materials, direct labour, direct chargeable expenses such as power, repairs, etc, If production increases, the costs will also increase and vice versa.

15. **What is contribution?**

Contribution is the difference between sales and marginal cost of sales. The formulae for contribution are as follows:

-Contribution = Sales

Or - = Variable

Sales cost

Or = Fixed cost ± Profit or loss

Part – B (16 Marks)

1. Explain in detail about flow in an economy. (16) (Nov/ Dec 2010)
2. Explain the concept of law of supply and demand with suitable example. (16)
3. Briefly explain about element of cost and its classification. (16)
4. Explain the concept of break-even analysis with clear diagram. (16) (April/ May 2009)
5. Briefly explain about process planning and its various types. (16)
6. (i) Bring out the scope of engineering economics with appropriate examples. (8)

(ii) A concern manufacturing a domestic appliance proposes to put up an improved model in market and the selling price for the same to be Decided .The selling price will cover the overheads and ensure the proportion of profit on sales as before. The material in the new model will cost Rs 4000 and the direct wages would be Rs 2000. Following figures relate to the previous year:

Stock material on 1st April 2006 Rs 2,00,000
Stock material on 31 st March 2007 Rs 2,20,000
Purchase of raw material in this period Rs
5,20,000 Manufacturing wages Rs 1,60,000
Works overhead Rs 80,000

Administrative and sales overhead Rs
80,000 Sales during the year Rs 9,02,000

Suggest a selling price .Overhead absorption base on % of direct labour. (April 2009, 2014)

7. (i) Explain the process of material selection in new product development (8)

(ii) From the following details, calculate the breakeven point .What will be the selling price per unit if breakeven point to be brought to 900 units: variable cost per units Rs 750; fixed expenses Rs 27, 00,000;

Selling price per unit Rs 1,000. (April/ May 2008) (Nov/ Dec 2014)

From the following figure, find out 1. Break even sales quantity; 2. Break even sales If production quantity is 30,000 find contribution and margin of safety, FC =RS 10,00,000; VC = RS 50; SP/unit=RS 100.

Max and co. has the following cost data for two successive period

	Year-I(Rs)	Year-II(Rs)
Sales	50,000	1, 20,000
FC	10,000	20,000
VC	30,000	60,000

8. Determine Break-even point.

(Nov/Dec 2015)

9. What is cost volume profit analysis? State the assumption and application of break-even analysis

UNIT – II: VALUE ENGINEERING

PART – A (2 Marks)

1. What do you mean by 'Make or Buy Decisions'?

Make or buy decision is a determination whether to produce a component part internally or to buy it from an outside supplier. The organization should evaluate the costs and benefits of manufacturing a product or product component against purchasing it and then select the alternative which results in the lower cost.

2. What are the different approaches followed in make or buy decisions?

The following are the approaches followed in make or buy decisions.

- a. Simple cost analysis
- b. Economic analysis
- c. Break-even analysis.

3. What is meant by value analysis/value engineering?

Value analysis is a special type of cost reduction technique. It critically investigates and analyses the different aspects of materials, design, cost and production of each and every component of the product in order to produce it economically without decreasing its utility, function or reliability.

4. What do you understand by value of a product?

Value differs from both price and cost in the sense that it is the cost proportionate to the function.

We can express value mathematically as

$$\text{Value} = \frac{\text{Function or utility}}{\text{Cost}}$$

5. Explain 'function'.

Function specifies the purpose of the product or what the product does, what is its utility etc.

6. What are the various functions of a product?

Functions can be classified into the following three categories:

- a. Primary functions
- b. Secondary functions
- c. Tertiary functions.

7. What are the various types of values?

- a. Cost value
- b. Exchange value
- c. Use value
- d. Esteem value.

8. Write any four objectives of value analysis.

- b. Simplify the product
- c. Use (new) cheaper and better materials
- d. Modify and improve product design so as to make it acceptable to consumer.

9. Differentiate value analysis and value engineering.

The major differences between value analysis and value engineering are:

Sl.no	Value analysis	Value engineering
1	Value analysis is the application of a set of techniques to an existing product with a view to improve its value.	Value engineering is the application of exactly the same set of techniques to a new product at design stage.
2	It is a remedial process.	It is a preventive process.

10. List any four advantages of value engineering.

- a. Value engineering/analysis identify and reduce the product cost b, It modifies and improves the product design
- c. It increases the performance/utility of the product by economical means d. It helps to generate new ideas.

11. What is sinking fund factor?

The factor $i/(1+i)^N - 1$ is called the equal payment series sinking fund factor or sinking fund factor, and is referred to by the notation (A/F, i, N). A sinking fund is an interest-bearing account into which a fixed sum is deposited each interest period; it is commonly established for the purpose of replacing fixed assets.

12. What is capital recovery factor?

The factor $i(1+i)^N / (1+i)^N - 1$ is called the equal payment series capital recovery factor, or simply capital recovery factor, which is designated (A/P, i, N). In finance this A/P factor is referred to as the annuity factor. The annuity factor indicates a series of payments of a fixed, or constant, amount for a specified number of periods.

13. What is uniform gradient conversion?

$$(1+i)^N - i - 1N$$

-----The factor is called the uniform factor or the gradient to equal payment $i[(1+i)^N - 1]$

series conversion factor and is designated (A/G, i, N). The future sum of annual equal payments at the end of every year for N years is equal to the total amount of gradient series at the end of N years.

14. What is 'effective interest rate'?

Effective interest rate is a percentage that is periodically applied to measure the cost of money when the interest rates compounded for less than a year i.e., monthly, quarterly and half yearly. The formula to compute effective interest rate is

$$R = (1+i/C)^C - 1$$

Where i = the nominal interest rate

C = the number of interest periods in a year.

15. Explain the concept of Discounting ?

Finding the present worth of a future sum is simply the reverse of compounding and is known as discounting process. The formula to obtain present worth is

$$P = \frac{F}{(1+i)^N} = F(P/F, i, N)$$

where (P/F, i, N) is the factor notation for single payment present worth factor. The interest rate i and P/F factor are also referred to as the discount rate and discounting factor, respectively.

Part – B (16 Marks)

1. Explain in details about criteria for make or buy Decision and its approaches?
2. What are all the functions, aims of value engineering? Discuss the value engineering procedure. (A/M 2009)
3. (i) What is time value of money. Explain in detail.
(ii) Compute the present value of Rs 1000 receivable 6 years hence if rate of discount is 10 percent.
4. Compare and contrast six basic types of time value of money problems with an example situation in which they would each apply.
5. Write the equation for Interest compounding of a capital (Yearly, Half Yearly, and Quarterly Compounding).
6. (i) What is uniform gradient conversion? Illustrate with an example. (A/ M 2009)
(ii) What is value engineering? With suitable example, explain the various phases of value
7. A manufacturing company has extra capacity which can be used to produce gears that the company has been buying for Rs.300 each. If the company makes the gears, it will incur material cost of Rs. 90 per unit, labour cost of Rs. 120 per unit and variable overhead cost of Rs. 30 per unit. The annual fixed cost associated with the unused capacity is Rs. 2,40,000. Demand over the next year is estimated at 4,000 units.
(i) Suppose the company make the gears or continue to buy?
(ii) Suppose the capacity could be used by another department for the production of some pump components that would cover its fixed and variable cost and contribute Rs. 90,000 to profit. Which would be more advantageous, gear production or pump components production. (Nov 2009, 2014)
8. Mr. X is planning for his retired life. He has 10 more years of service. He would like to deposit 20% of his salary, which is Rs.10,000, at the end of the first year and thereafter he wishes to deposit every year with an annual increase of Rs. 2,000 for the next 9 years. At an interest rate of 20%. Find the total amount at the end of the 10 year at which time he retires. (April/ May 2012)
9. A company has to replace a present facility after 15 years at an outlay of Rs. 5,00,000. It plans to deposit an equal amount at the end of every year for the next 15 years at an interest rate of 18% compounded annually. Find the equivalent amount that must be deposited at the end of every year for the next 15 years. (April/May 2015)
10. (i) Discuss the symptoms favoring the application of VAVE.
(ii) Mr.X is planning for his retired life; He has 10 years of service. He would like to deposit 20% of his salary, which is Rs. 4, 000, at the end of the first year, end thereafter he wishes to deposit the amount with amount with an annual increase of Rs.500 for the next 9 year with an interest rate of 15% Find the total amount at the end of the 10th year of the above series. (April/ May 2013, 2015)

UNIT – III: CASH FLOW

PART – A (2 Marks)

1. **What is revenue dominated cash flow?**

The profit/revenue, salvage value of all inflows to an organization will be assigned with positive sign and the cost outflows will be assigned with negative sign and this is called revenue dominated cash flow.

2. **What is cash dominated cash flow?**

The cost outflows will be assigned with positive sign and the profit, revenue, salvage value, all inflows etc., will be assigned with negative sign and this is called cost dominated cash flow.

3. **What is annual equivalent method of comparing alternatives?**

In the case of revenue dominated cash flow, the corresponding annual equivalent revenues are to be computed and compared, then the alternative with the maximum annual equivalent revenue should be selected as the best alternative.

In case of cost dominated cash flow the corresponding annual equivalent costs are to be computed and compared, then the alternative with the minimum annual equivalent cost should be selected as the best alternative.

4. **Mention the various rate of return methods.**

The various rate of return methods are:

- a. Internal rate of return (IRR)
- b. Average rate of return (ARR)
- c. Net present value method (NPV)
- d. Pay-back period (PBP).

5. **What is rate of return?**

Rate of return is the break-even interest rate, i , which equates the present worth of a project's cash outflows to the present worth of its cash inflows.

6. **What is present worth method?**

The present worth measures the surplus in an investment project at time zero (0). The present worth of all cash inflows is computed against the present worth of all cash outflows associated with an investment of project is called present worth method.

7. **What is future worth analysis?**

Net future worth measures the surplus at a time period other than 0. Future worth analysis is particularly useful in an investment situation where we need to compute the equivalent worth of a project at the end of its investment period.

8. **What is annual equivalent method?**

The criterion provides a basis for measuring investment worth by determining equal payments on an annual basis is called annual equivalent method.

9. **Write down the techniques for comparing the worthiness of a project.**

- a. Net present value methods
- b. Rate of return methods
- c. Ratio methods
- d. Pay back methods
- e. Annual equivalent methods
- f. Future worth method.

10. **Define IRR.**

IRR (Internal Rate of the Return) is the rate of return at which total present value of Future cash inflow is equal to initial investment. The rate of return is generally found by trial and error method.

11. **Define MARR.**

MARR (Minimum Attractive Rate of Return) represents the required or minimum interval rate of return for a project. The MARR is a minimum return the company will accept on the money it invests.

12. **What are the advantages of Rate of Return method?** The

advantages of Rate of Return method are:

- a. It is easy to understand and operate
- b. It uses the entire earnings of an investment proposal, unlike the payback period method.
- c. It gives a clear picture of the profitability of a project.

13. **What are the disadvantages of Rate of Return method?**

The disadvantages of Rate of Return method are:

- a. Ignores the time value of the money and treats all incomes same irrespective of their time of receipt.
- b. Reliability is affected due to the various concepts of investment.
- c. Cash flow aspect of projects is not properly assessed.
- d. Not useful to assess projects where investment is made in two or more installments at different times.

14. **What is the time value of money?**

The economic value of a sum depends on when it is received. Because money has earning power over time, (it can be put to work, earning more money for its owner), a rupee received today has a greater value than a rupee received at some future time.

Part – B (16 Marks)

1. Alpha Industry is planning to expand its production operation. It has identified three different technologies for meeting the goal. The initial outlay and revenues with respect to each of the technologies are summarized in the table below. Suggest the technology which is to be implemented based on the present worth method of comparison assuming 20% interest rate compounded annually. (Dec 2013) (Apr/May 2015)

Technology	Initial Outlay(Rs.)	Annual revenue(Rs.)	Life(Years)
1	12,00,000	4,00,000	10
2	20,00,000	6,00,000	10
3	18,00,000	5,00,000	10

2. A company must Decide whether to buy machine A or machine B: (Nov/Dec 2012) (Apr/May 2015)

	Machine A	Machine B
Initial cost	Rs.4,00,000	8,00,000
Useful life in years	4	4
Salvage value at the End of machine life	2,00,000/-	5,50,000/-
Annual Maintenance cost	40,000/-	0

At 12% interest rate, which machine should be selected? (use Future worth method of comparison)

3. A company is planning to purchase an advanced machine centre. Three original manufactures have responded to its tenders whose particulars are tabulated below:

Manufacturer	Down Payment	Yearly equal Installment	No:of Installments
1	5,00,000	2,00,000	15
2	4,00,000	3,00,000	15
3	6,00,000	1,50,000	15

Determine the best alternative based on annual equivalent method by assuming $i=20%$, compounded annually. (Dec 2013) (Nov/Dec 2012)

4. A transport company has been looking for a new tyre for its truck and has located the following alternatives.

Brand	Tyre warranty (months)	Price per tyre (Rs)
A	12	1200
B	24	1800
C	36	2100
D	48	2700

If the company feels that the warranty period is a good estimate of the Tyre life and that a nominal Interest rate (compounded annually) of 12% is appropriate, which tyre should it buy? (Nov/Dec 2014)

5. A person is planning a new business. The initial outlay and cash flow pattern for the new business are listed below. The expected life of the business is five years, Find the rate of return for the new business. (May 2010)

Period	0	1	2	3	4	5
Investment	-1,00,000	30,000	30,000	30,000	30,000	30,000

6. An engineer has two bids for an elevator to be installed in a new building. The details of the bids for the elevators are given below.

Bid	Engineer's Estimate		
	Initial cost	Service life (years)	Annual operations & maintenance
Alpha Elevators Inc	4,50,000	15	27,000
Beta Elevators Inc	5,40,000	15	28,500

Determine which Bid should be accepted, based on the present worth method of comparison assuming an interest rate of 15%, compounded annually.

Consider the following two mutually exclusive alternatives

Alternative	End of year				
	0	1	2	3	4
A(Rs.)	-50,00,000	20,00,000	20,00,000	20,00,000	20,00,000
B(Rs.)	-45,00,000	18,00,000	18,00,000	18,00,000	18,00,000

At $i=18\%$ select the best alternative based on Future worth method of comparison. (Nov/Dec 2014)

7. Explain the concept of cash flow and different methods of comparison of alternatives. List the merits and limitations of each method if any. (May/June2013)
8. Discuss with example, present worth method and future worth method of comparison alternatives.
(Dec2009)
9. Compare Annual Equivalent method and rate of return method of comparing alternatives with appropriate examples. (Dec2009)

UNIT – IV: REPLACEMENT AND MAINTENANCE ANALYSIS

PART – A (2 Marks)

1. What is replacement analysis?

Replacement analysis involves the replacement of existing obsolete or worn-out assets in order to avoid failure in operations. The problems often faced by management of various industries are whether to replace the existing equipment with new and more efficient equipment or to continue to use existing equipment, and when existing equipment should be replaced with efficient equipment. This class of decision analysis is known as replacement analysis.

2. What is meant by gradual failure?

Gradual failure is progressive in nature. It can be depicted in machine equipment, which is gradually depreciating or deteriorating with the time resulting in very high operating and maintenance costs and/or decreased residual value.

It is easier to predict such type of failures and take the corrective measures by providing a replacement policy for such machine equipment.

3. Define economic service life of an asset?

The economic service life of an asset is defined to be the period of useful life that minimizes the annual equivalent cost of owning and operating the asset.

4. What are the types of replacement problem?

a. Replacement of assets that deteriorate with time (replacement due to gradual failure, or wear and tear of the components of the machine). This can be further classified into the following types:

- i) Determination of economic life of an asset
- ii) Replacement of an asset with a new asset.

b. Simple probabilistic model for assets that fails completely. (Replacement due to sudden failure)

5. Explain capital recovery cost.

Capital recovery cost computed from the first cost (Initial investment/purchase price) of the machine. Generally speaking, as an asset becomes older, its salvage value becomes smaller. As long as The salvage value is less than the initial cost, the capital recovery cost is a decreasing function of the life of the asset. In other words, the longer we keep an asset, the lower the capital recovery cost becomes.

6. Explain operating costs.

The operating costs of an asset include operation and maintenance (O&M) costs, labour costs, material costs, and energy consumption costs. O&M costs tend to increase as a function of the age of the asset. Because of increasing trend of the O&M costs, the total operating costs of an asset usually increases as the asset ages. As long as the annual operating cost increases with the age of the equipment, the annual equivalent operating cost is an increasing function of the life of the asset.

7. Explain annual equivalent total cost.

Annual equivalent total cost of owning and operating an asset is a summation of the capital recovery cost (average first cost) and the annual equivalent operating costs of the asset.

8. Explain sunk costs.

The purchase costs of an equipment three years ago and repair cost of last year are called as sunk costs. A sunk cost is any past cost unaffected by any future investment decision.

In a proper engineering economic analysis, only future costs should be considered; past sunk costs should be ignored.

9. What is meant by maintenance?

Maintenance is concerned with the day-to-day problem of keeping production facilities and equipment in proper operating condition.

The machines and equipments should be continuously monitored for this efficient functioning. Otherwise, the quality of service will be poor and the cost of operation and maintenance would increase with the passage of time.

10. Name the types of maintenance.

- a. Corrective or Breakdown maintenance
- b. Scheduled maintenance
- c. Preventive maintenance
- d. Predictive maintenance.

11. State the main causes of breakdown.

- a. Failure to replace worn out parts
- b. Lack of lubrication
- c. Indifference towards minor faults.

12. State any two disadvantages of breakdown maintenance.

- a. Delays in production
- b. Faster plant deterioration.

13. What is predictive maintenance?

In predictive maintenance, equipment conditions are monitored and measured periodically or on continuous basis and this enables maintenance man to take action such as equipment adjustment, repair or overhaul. This will extend the service life of equipment without fear of failure.

14. What is the significance of timely maintenance?

Timely maintenance makes more running time of machines and equipments and helps in the continuous production thereby improving the productivity of the organisation.

15. **What is preventive maintenance?**

Preventive maintenance is defined as any action performed in an attempt to keep a machine in a specified operating condition by means of systematic inspection, detection, and prevention of incipient failures. It minimizes breakdown maintenance.

Part – B (16 Marks)

1. A firm is considering replacement of equipment, whose first cost is Rs. 4,000 and the scrap value is negligible at the end of any year. Based on experience, it was found that the maintenance cost is zero during the first year and it increases by Rs. 200 every year thereafter. (a) When should the equipment be replaced if $i = 0\%$ (b) When should the equipment be replaced if $i = 12\%$. (Apr/ May 2008; Nov/ Dec 2011; April/May 2015)

2. A firm is considered replacement of equipment, whose initial cost is Rs.6000 and Scrap value is negligible at the end of any year. Based on experience it was found that the maintenance cost is zero at the first year and it increases by Rs.200 every year thereafter

(a) When should the equipment be replaced if $i = 0\%$ (b) When should the equipment be replaced if $i = 12\%$

2. The following table gives the operation cost, maintenance cost, and salvage value at the end of every year of a machine whose purchase value is Rs.15000. Find the economic life of the machine assuming interest rate, $i = 15\%$ (April/May 2015)

End of Year	Operation cost at the end of year	Maintenance cost at the end of year	Salvage value at the end of the year
1	3000	300	9000
2	4000	400	8000
3	5000	500	7000
4	6000	600	6000
5	7000	700	5000
6	8000	800	4000
7	9000	900	3000
8	10000	1000	2000
9	11000	1100	1000
10	12000	1200	0

4. The following data are available for the existing equipment and for the proposed equipment to replace existing one. Find whether the concern should go for replacement or not. (Nov/Dec 2014)

Factors	Existing	Proposed
	Equipment	Equipment
Cost	Rs.5000 Market Value	Rs.10000 Installed Cost
Operating Expenses	Rs.5000	Rs.3888.9
Scrap Value	Rs.500	Rs.1000
Interest	10%	10%
Life of Equivalent	1 Year	9 Years

5. Given below is the data of two equipments. Find out which alternative you will select. (April/May 2008)

Factors	Existing	Proposed
	Equipment	Equipment
Initial Cost (p)	Rs.10000	Rs.15000
Annual Operating Cost	Rs.1000	Rs.800
Life of the equipment	8 years	8 years
Salvage Value (L)	Rs1000	Rs3000
Interet Rate (i)	5%	5%

6. A new material handling system costs Rs.25000 (installed) including the cost of the layout. This Decreases the number of material handling workers by 5. After adding increased maintenance and power costs, the net monetary advantage is estimated as Rs.1200/year. Its estimated economic life is 5 years. Calculate the rate of return before and after tax. Assume a depreciation of term of 10 years.
7. Two years ago, a CNC lathe was purchased at a cost of Rs.250000 to be useful for 8 years. Its salvage value at the end of its life is Rs25000. The annual maintenance cost is Rs25000. The market value of the present machine is Rs150000. Now, a new CNC lathe to cater to the need of the present

lathe is available at Rs200000 to be useful for 6 years. Its annual maintenance cost is Rs14000. Salvage value of the new lathe is Rs20000. Using an interest rate of 12%, find whether it is worth replacing the present lathe with the new lathe(Nov/Dec 2014)

8. Three years back, Goa Corporation purchased a 10hp motor for pumping drinking water. Its useful life was estimated to be 10 years. Due to the fast development that logically, the corporation is unable to meet the current demand for water with the existing motor. The corporation can cope with the situation by augmenting an additional 5 hp motor or replacing the existing 10 hp motor with a new 15 hp motor. The details of these motors are now tabulated.

Details of Motors	Old 10 HP	New 5 HP	New 15 HP
	Motor	Motor	Motor
Purchase Cost (P)Rs.	25000	12000	32000
Life in years (n)	10	7	7
Salvage value (L) at the end of machine life.Rs.	1500	800	5000
Annual Operating and Maintenance costs.Rs.	1600	1000	500

The current market value of the 10 hp motor is Rs.15000. Using an interest of 15% suggest the best alternative for the corporation. (April/May 2009)

9. The following rates of transistors in a computer are summarized in table 1.1

End of week	1	2	3	4	5	6	7
Probability of failure to date	0.07	0.18	0.30	0.48	0.69	0.89	1.00

The cost of replacing individual failed transistor is Rs.9. If all the transistors are replaced simultaneously, it would cost Rs.3/transistors. Any one of the two options can be followed to replace the transistors.

(a) Replace the transistors individually when they fail (INDIVIDUAL REPLACEMENT Policy)

(b) Replace all the transistors simultaneously at fixed intervals and replace the individual transistors as they fail in service during fixed interval (GROUP REPLACEMENT Policy) Find out the optimal replacement policy. (Nov/ Dec 2010)

10. What is defender challenger concept in replacement? Illustrate with an example (ii) Explain the causes for replacement of assets, in detail with examples.
11. (i) Explain cash flow within a firm with neat diagram. (ii) Explain with the format of cash flow statement.

UNIT – V: DEPRECIATION

PART – A (2 Marks)

1. Define the term 'Depreciation'.

Depreciation is the process of allocating the acquisition cost of the tangible assets less salvage value, if any, in a systematic and a rational manner over the estimated life of the asset.

2. Mention the various methods used in depreciation calculation.

The various methods used in depreciation calculations are:

- a. Straight line method
- b. Declining balance method
- c. Sum of the years digits method
- d. Sinking fund of annuity method
- e. Service output method.

3. What are the causes of depreciation?

The causes of depreciation are:

- a. Wear and tear
- b. Depletion
- c. Obsolescence
- d. Lapse of time.

4. Write five reasons for providing depreciation.

The reasons for providing depreciations are:

- a. To know the correct profits
- b. To show correct financial position
- c. To make provision for replacement of assets
- d. To compute tax liability
- e. To decide for how much to buy or sell the assets in the second-hand market.

5. How to compute the sum of the digits of the years, if an asset has a life of six years?

Sum of the years = $1+2+3+4+5+6 = 21$

$$\begin{aligned} 21 &= \frac{(n+1)}{2} \\ &= \frac{6(6+1)}{2} \\ &= \frac{42}{2} = 21 \end{aligned}$$

6. What is evaluation of public alternatives?

Evaluation of public alternative is nothing but the selecting of best alternative from the available alternatives.

7. What is the main objective of evaluation of public alternatives?

To provide goods and services to the public at the minimum cost is the main objective of evaluation of public alternatives. In this situation, public alternative evaluation must consider a point that whether the benefits of the public activity are at least equal to its costs of consumption during the job.

8. What is 'Book value'?

The value at which an asset is carried on a balance sheet is called book value. In other words the cost of an asset minus accumulated depreciation is known as book value.

9. Define the term 'Benefit cost ratio'

The ratio between the equivalent benefit and equivalent costs is called the benefit cost ratio.

$$\text{i.e BC} \frac{\text{Equivalent benefits}}{\text{Equivalent costs}} \text{ratio=}$$

10. Define the term 'inflation'

Inflation may be defined as a sustained rise in the general price level. It is an economic condition where there is a rise in prices resulting in the fall in the purchasing power of money.

11. What are the types of inflation?

The types of inflation are:

- a. Creeping inflation
- b. Moderate inflation
- c. Galloping inflation
- d. Hyper inflation.

12. What is service output method of depreciation?

Service output method of depreciation is a type of computing depreciation based on service rendered by an asset.

13. What is sinking fund?

A depreciation fund, equal to be actual loss in the value of the asset, is estimated for each year. This amount is invested outside the business in a separate account called sinking fund investment account at a certain rate and the interest will be earned on the fund. Therefore the sinking fund will rise year after year.

14. What is amortization?

Amortization is a routine decrease in value of an intangible asset, or the process of paying off a debt

over time through regular payments. Amortization refers to the expensing of intangible capital assets (intellectual property: patents, trademarks, copyrights, etc.) in order to show their decrease in value as a result of use or passage of time.

15. What is functional depreciation?

Functional depreciation occurs as a result of changes in the organisation or in technology that decrease or eliminate the need for an asset. Examples of functional depreciation include obsolescence attributable to advances in technology, a declining need for the services performed by an asset, or the inability to meet increased quantity and/or quality demands.

Part – B (16 Marks)

1. (i) Define Depreciation and list down the factors affecting the periodic allocation of depreciation (8)
(ii) Write down the Classification of depreciation and explain in detail. (8) (Nov/Dec 2012; April/May 2008)
2. (i) A machine costing Rs.24,000 was purchased on 1st December 1985. The installation and erection charges were Rs.1000 and its useful life is expected to be 10 years. The scrap value of the machine at the end of the useful life is Rs5000. Calculate the yearly depreciation by straight line method. (8)

(ii) An engine lathe was purchased for Rs.20,000. Its useful life was estimated as ten years and the salvage value as Rs5000. Using diminishing balance method, calculate the depreciation ratio. Also estimate the depreciation fund at the end of two years. (8)
3. (i) Estimate the rate of depreciation from the following data, using sinking fund method: Cost of machine Rs10,000. Scrap value Rs.4000. Interest at the rate of 8% compound and the useful life of machine 5 years. (8)

(ii) Find out the depreciation annuity by the annuity charging method after 3 years, when the cost of machine is Rs.8000 and the scrap value is Rs.4000 only. Rate of interest is 5 percent. Also calculate the value of the machine after 2 years. (8) (Nov/Dec 2014)
4. (i) A machine costing is Rs.4,50,000 has a scrap value of Rs50,000 after 10 years of service. The estimated rate of production is 12 units per hour. Using the productive unit method calculate the rate of depreciation and also depreciation per year. Assume 50 week per year and 48 working hours per week. (8)

(ii) For the same problem calculate the depreciation charges per hour considering useful life of machines (8)
5. The state govt. of GOA is planning to construct a bridge across the river. The estimated initial investment for constructing the bridge is Rs35,00,000. The estimated life of bridge is 15 years. The annual operation and maintenance cost is Rs.1,50,000. The value of fuel savings due to construction of bridge is Rs.5,00,000. in the first year and it increases by Rs50,000 every year thereafter till; the end of the life of the bridge. Check whether the project is justified based on BC RATIO by assuming an interest rate of 12% compounded annually. (April/May 2010) (Nov/Dec 2014)
6. The state govt of Punjab is planning a hydroelectric power project for a river basin. In addition to the production of electric power, the project will provide flood control and irrigation benefits. The estimated benefits and the cost that are expected to be derived from this project are as follows; Initial cost = Rs8,00,00,000; Annual cost= Rs60,00,00; Annual flood control savings=Rs30,00,000; Annual irrigation benefits= Rs50,00,000; Annual operating and maintenance cost= Rs30,00,000; Life of the project= 50years. Suggest whether the state government implement the project (Assume $i=12\%$)

(April/May 2009) (April/May 2015)
7. Two mutually exclusive projects are considered for investment. Project A requires an initial outlay of Rs40,00,000 with net receipts estimated at Rs9,00,000 per year for the next 5 years. The initial outlay for the project B is Rs75,00,000 and the net receipts are estimated as Rs25,00,000 per year for the next five years. There is no salvage value associated with either of the projects. Using the benefit cost ratio, which project would you select? Assume an interest rate of 10%.

8. A state govt of Maharashtra is planning a hydro electric project for a river basin. In addition to the production of electricity, this project provides flood control, irrigation and recreation benefits. The estimated benefits and cost that are expected from the two alternatives under consideration are given in the following table

Description	X	Y
	Rs	Rs
Initial Cost (P)	15,00,00,000	40,00,00,000
Annual equivalent benefit and cost		
Operating & Maintenance cost	20,00,000	35,00,000
Power sales/year	1,00,00,000	1,80,00,000
Flood control Savings	25,00,000	50,00,000
Irrigation benefits	35,00,000	60,00,000
Recreation benefits	10,00,000	35,00,000

If the interest rate is 9% and the life of project is estimated to be 50 years, by comparing the BC ratios, determine which project should be selected. (Nov/Dec 2013) (April/May 2015)

9. (i) Define Inflation. Define the money flow and product flow concepts pertaining to national income.(6)
(ii) Explain the following (i)GNP (ii)GDP (iii)NNP (iv) NDP and explain the different methods used for measuring National Income. (6) (April May 2008, 2010,2013, (Nov/Dec 2013)
10. (i) Define Inflation and elucidate on the degree of inflation. (6) (April/ May 2010)
(ii) Explain in detail the (a) causes of inflation and (b) effect of inflation (14) (Nov/Dec 2013)