

CBCS SCHEME

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18ME51

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022 Management and Economics

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Discrete compound interest factors handbook tables is permitted.

Module-1

- 1 a. Define management and explain the function to be performed by managers to at air the set goals. (10 Marks)
b. Define planning and briefly discuss the steps involved in planning. (10 Marks)

OR

- 2 a. Discuss the functional areas of management. (12 Marks)
b. Explain the steps involved in rotational decision making. (08 Marks)

Module-2

- 3 a. Write a note on principle of organization. (12 Marks)
b. Explain Maslow's need hierarchy theory in brief. (08 Marks)

OR

- 4 a. Explain the terms MBO and MBE. (10 Marks)
b. What is controlling and explain the steps in control process. (10 Marks)

Module-3

- 5 a. Explain the law of demand and law of supply with suitable examples. (08 Marks)
b. Explain the 72 rule of present worth. (04 Marks)
c. A man wishes to have a future sum of Rs.50 lakhs for his daughters education for 10 years from now. What is the single payment that he should deposit so that he gets the desired amount after 10 years. The bank offers 12% rate of interest, compounded annually. (08 Marks)

OR

- 6 a. Define engineering economics and briefly explain microeconomics and macroeconomics. (10 Marks)
b. A man is planning to build his house. He plans to invest Rs.40,000 per year for the next 10 years. The bank offers 12% interest rate compounded annually. Find the maturity value of his account after 10 years. (10 Marks)

Module-4

- 7 a. Explain future worth method of comparison. (06 Marks)
b. Explain IRR (Internal Rate of Return) and MARR (Minimum Acceptable rate of Return). (06 Marks)
c. Following are the estimates of two alternate investment made in two different machines in an industry. Find out which machine has the fastest payback period.

	Particulars	Machine A	Machine B
1	Initial investment	30,000	42,000
2	Annual receipts	20,000	26,000
3	Annual expenditures	5,500	7,000
4	Economics life	4 years	4 years

(08 Marks)

OR

- 8 a. Rs.10 crores was generated by the management of an engineering college for the construction of its new mechanical science block. Annual maintenance of the block is estimated to be Rs.10 lakh. In addition Rs.12 lakh will be needed every 10 years for painting and Hoyer repairs. If the budget granted has to take care of perpetual maintenance, how much of the amount can be used for initial construction costs? Deposited funds can earn 6% rate of interest compounded annually. Assume that taxes and inflation do not come into picture. (12 Marks)
- b. What are the various method of comparing the worthiness of engineering projects. Explain any one method. (08 Marks)

Module-5

- 9 a. What are the various components/causes of depreciation? (05 Marks)
- b. Explain how selling price is fixed for a product and show all the components of cost. (05 Marks)
- c. An investment of Rs.8,000 is made by Suresh for his manually operated pen machine. Its salvage value after 5 years is Rs.1000. Find straight line depreciation expense? Find the book value at the end for each year and also. Find the depreciation fund collected at the end of 4th year. (10 Marks)

OR

- 10 a. Differentiate between estimation and testing. (05 Marks)
- b. Explain briefly the objectives of costing. (05 Marks)
- c. A cost iron component, as shown in figure below is to be manufactured. Estimate the selling price per piece from the following data :
- Density of material = 7.2gm/cc
 Cost of molten metal = Rs. 20/kg
 Process scrap = 20% of net weight
 Scrap return value = Rs.6/kg
 Administrative overheads = Rs.30/hour
 Sales overheads = 20% of factory cost
 Profit = 20% of factory cost
 Other expenditures are as follow :

Operation	Time/piece minutes	Labour cost per hour is Rs.	Shot overheads Rs./hour
Moulding and paring	15	20	60
Shot blasting	5	10	40
Fettling and inspections	6	10	40

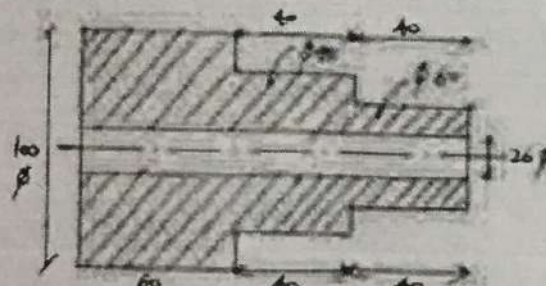


Fig.Q10(c) All dimensions are in 'mm'

(10 Marks)

VTU QUESTION PAPER SOLUTION (Feb./Mar. 2022)

Subject: Management and Economics.

Code: 18ME51 Semester: 5

Module-1

1. a: Definition of the Management:

To manage is to forecast and plan to organise, to compound, to coordinate and to control

Functions of Management:

- (i) Planning
- (ii) Organising
- (iii) Staffing
- (iv) Directing
- (v) Controlling.

Planning: Planning is the beginning of the process of the management. Planning follows system approach which results in and emphasis being given to three major sub-systems, viz, environmental subsystem, the competitive sub-system and the internal sub-system.

Planning is an intellectual process which requires a manager to think before acting.

Organising: Organising is the process of identifying and grouping of the work to be performed, defining and delegating responsibility and authority and establishing relationships for the purpose of enabling people to work most effectively together in accomplishing their objectives. Organising is a pattern of ways in which large numbers of people, too many have to intimate face to face contact with all others.

Staffing: Filling and keeping the positions provided for by the organisation structure filled with the right people is the staffing phase of the management function. It includes several sub-functions like, recruitment, Selection, Training, Performance appraisal and administration of compensation plans.

Directing: Directing is a vital managerial function. For effective implementation of any administrative decision, planning, organising and staffing are not enough. The manager must stimulate action by giving direction to his subordinates through orders and also supervise their work to ensure that the plans and policies achieve the desired actions and results. The function of direction thus breaks down into two major activities:

- i. Giving orders to employees.
- ii. Leading and motivating employees.

Controlling: Controlling is the function of checking current performance against predetermined standards contained in the plans, with a view to ensuring adequate progress and satisfactory performance. Controlling is determining what is being accomplished, that is evaluating the performance and if necessary, applying corrective measures to conform the plans.

1 b) DEFINITION OF PLANNING:

Planning involves selecting missions and objectives and the actions to achieve them, it involves decision making

STEPS INVOLVED IN PLANNING:

- (i) Establishing verifiable goals or set of goals to be achieved.
- (ii) Establishing Planning premises.
- (iii) Deciding the planning period.
- (iv) Finding alternative courses of action.
- (v) Evaluating and selecting a course of action.
- (vi) Developing derivative plans.
- (vii) Establishing and Deploying action plans.
- (viii) Measuring and controlling the progress.

- (i) The first step in planning is to determine the enterprise objectives. These are set by top level managers.
- (ii) Plans are made to operate in the future. Hence, the second step in planning is to establish planning premises, i.e., certain assumptions about the future on the basis of which the plan will be ultimately formulated. The planning premises can be classified as,

- (a) Internal and External premises.
- (b) Tangible and Intangible premises.
- (c) Controllable and non-controllable premises.

- (iii) Deciding the planning period by upper level managers is the third step in planning process. The factors that influence the choice of the period are as follows:

- (a) Lead time in developmentⁿ of new product.
- (b) Time required to recover capital
- (c) Length of commitments already made.

- (iv) The fourth step in planning is to find alternative courses of action. For instance, technical know-how may be secured by engaging a foreign technician or by training staff abroad.
- (v) Evaluating and selecting course of action is the fifth step and is to evaluate the alternatives in the light of the premises and goals and to select best course of action.
- (vi) Developing the derivative plan is to draw up the appropriate plans for the sub-units of the organisation. These are the plans which are derived from the basic plan and not prepared independently.
- (vii) Establishing and deploying action plans represent 'the lowest level of execution'.
- (viii) Measuring and controlling the progress is the final step in planning. This is the step to compare the executions to the designed plans.

2 a. FUNCTIONAL AREAS OF MANAGEMENT :

- (i) Production Management.
- (ii) Financial Management.
- (iii) Human Resource Management.
- (iv) Marketing Management.
- (v) Materials Management.
- (vi) Supply chain Management.
- (vii) Transportation Management.
- (viii) Sales Management.

Production Management covers the productivity issues and production rate. The financial management is the process of managing flow of money in various activities. It decides the production capacity and the status of the organisation. Human Resource Management takes care of people required to be recruited and assigning them the specific tasks.

Marketing management is an activity where, the various methods of projecting and publicizing the product so that it gets better sales. Materials management is that part of management activity where, the material required for production, its availability, Procurement process, maintaining the lead time being done. Supply chain management is the process where it is taken care that, there is no delay ~~pro~~ period for machines as well as ~~not~~ no pile up of semifinished goods at any station. Transportation is an important activity which is to be assigned optimally to reduce freight charges. Sales management is an activity which deals with the quantity of sales and its maintenance towards consistency.

2 b. STEPS INVOLVED IN DECISION MAKING:

Decision is the selection of alternatives and the process has the following steps:

- (i) Specify Objective.
- (ii) Identification of problem.
- (iii) Search for alternatives
- (iv) Evaluation of alternatives.
- (v) Choice of alternative.
- (vi) Action
- (vii) Results.

Specify objective tells the requirement of decision to be made for the situation.

Next, the problem is to be identified or recognized. The process is done by finding the deviation from the standard or predetermined goal. For eg. Profits are less than anticipated, a department is exceeding its budget or a project is off schedule.

After identifying and recognizing the problem, it is the step to development of alternatives. This is because, every course of action has an alternative. Once, the alternatives are set, evaluation is necessary to check their outcomes. The best alternative is to be selected. The choice of alternative is done by looking at its financial benefits and feasibility.

Once the best alternative is selected, it is implemented which is termed as an action phase. After the action phase, the results are to be compared with the desired outcomes.

3a.

PRINCIPLE OF ORGANIZATION:

- (i) Objectives.
- (ii) Specialisation
- (iii) Span of Control
- (iv) Management by exception principle.
- (v) Scalar Principle
- (vi) Unity of Command
- (vii) Delegation
- (viii) Responsibility
- (ix) Authority
- (x) Efficiency
- (xi) Simplicity
- (x) Flexibility
- (xi) Balance
- (xii) Unity of Direction
- (xiii) Personal ability
- (ix) Acceptability

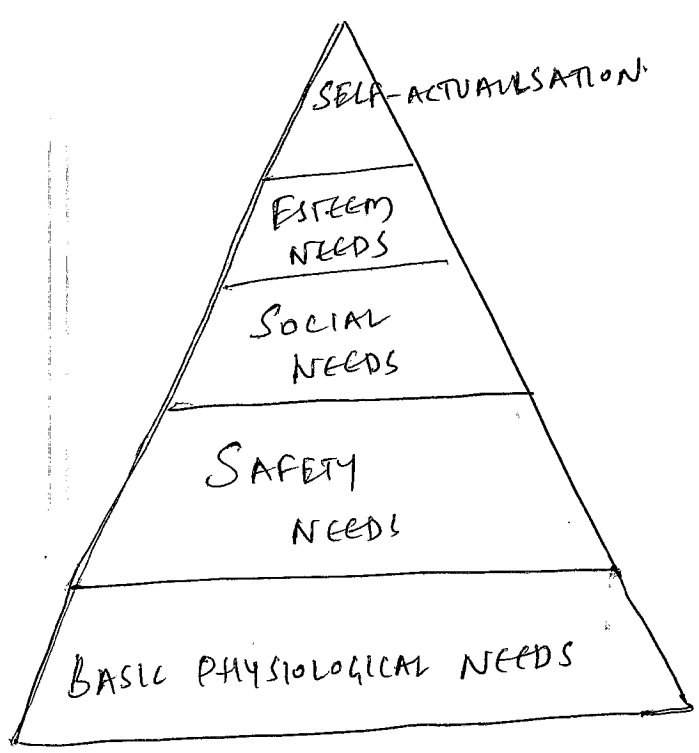
The objectives of the enterprise influence the organisation structure and hence the objectives of the enterprise should first be clearly defined.

Effective organisation must promote specialisation. As there is a limit to the number of persons that can be supervised effectively by one boss, the span of control should be as far as possible, the minimum. That means, an executive should be asked to supervise a reasonable number of ^{sub-}~~sub~~ordinates.

As the executives at the higher levels have limited time, only exceptionally complex problems should be referred to them and routine matters should be dealt with by the subordinates at lower levels. The chain of command is the scalar principle where the line of authority from the chief executive at the top to the first line supervisor at the bottom must be clearly defined. There is a need of unity of command that avoids ambiguity in flow of command.

3 b.

MASLOW'S HIERARCHY OF NEEDS :



Physiological needs are those which arise out of the basic physiology of life. for eg. need of food, water, air, etc. These needs must be at least partially satisfied for continued survival. Security needs are the needs to feel both economically and psychologically secure.

Social needs are associated with other people and acceptance by them. These can be referred as love and affection needs.

Esteem needs are those which relate to respect and prestige. A need for dominance may be thought of as one of the egoistic needs. There are of two types: self-esteem and esteem for others. Self esteem is and individual's need to feel inside himself that he is worthy. He has also the need that others think he is worthy.

Self-fulfilment needs are the needs for realising one's potential. These include the need of realising one's capabilities to the fullest.

According to Maslow, people attempt to satisfy their physical needs first. Once that need is satisfied, it ^{will} no more be a ~~motivating~~ motivating factor.

4 a.

MBO (Management by Objectives)

Management by objectives has important steps as follows:

- i) objectives.
- ii) Tracking progress
- iii) Evaluating results.

(i) Setting objectives: This step is implemented "top down". Given appropriate planning premises, first the top executives meet and decide the organizational goals for some specific period.

(ii) Tracking Progress: After the specific period the individual manager and his superior jointly review the progress against goals.

(iii) Recycling: Organized tracking of progress leads (Evaluating results) to a repetition of the cycle with a revision of objectives, roles, priorities and allocations of resources from the overall organizational level through unit level, team level to individual level.

MBE (Management by Exception):

MBE tries to focus on exceptionally serious deviations from the plans and standards. According to this principle, a manager should give more attention on unusual or exceptional items. Only important deviations from established standards should be brought to the notice of management. If the actual performance is within an acceptable range of deviation from the standard, it need not to be reported to management as no remedial action is required.

MBE has following benefits:

- (i) It saves time
- (ii) It identifies critical problem areas.
- (iii) It stimulates communication
- (iv) It reduces frequency of decision making.

46. | CONTROLLING:

It is an important function of management. "Control is checking current performance against predetermined standards contained in the plans, with a view to ensure adequate progress and satisfactory performance. Controlling is also determining what is being accomplished, that is, evaluating the performance and if necessary, applying corrective measures so that performance takes place according to plans".

A control system is needed for the following purposes:

- (i) measuring progress.
- (ii) uncovering deviations.
- (iii) indicating corrective actions.
- (iv) transmitting corrective action.

STEPS IN CONTROL PROCESS:

There are three basic steps in a control process:

1. Establishing Standards.
2. Measuring and comparing actual results against standards.
3. Taking corrective action.

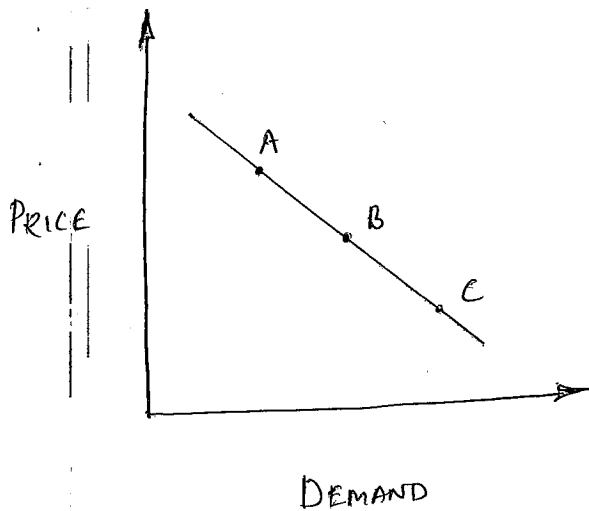
ESTABLISHING STANDARDS: The first step in control process is to establish standards against which results can be measured. Since, entire operations cannot be observed, each organisation must develop its own key area result list.

MEASURING AND COMPARING ACTUAL RESULTS: This second step is to measure the result and compare it with the predetermined standards.

TAKING CORRECTIVE ACTION: After comparing the actual performance with prescribed standards and finding the deviations and later the manager is to correct these deviations.

5 a. LAW OF DEMAND AND LAW OF SUPPLY :

LAW OF DEMAND :



The amount demanded increases with a fall of price and diminishes with rise in price. It can be termed as a negative relationship between price and demand quantity.

Ex.: Maruti Suzuki Cars.

From the graph above:

A → Price High, Demand less.

C → Price Low, Demand high.

LAW OF SUPPLY:

Law of supply demonstrates the quantities that will be sold at a certain price. Higher the price, higher the quantity supplied. Reduction in supply leads to higher price.

Eg. Agriculture crops are planned based on price in the market.

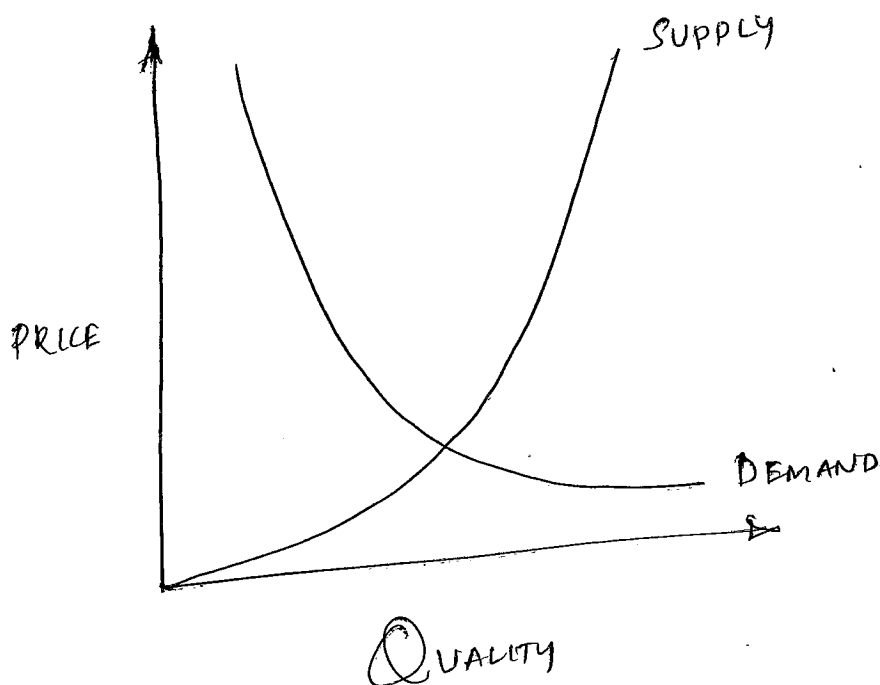
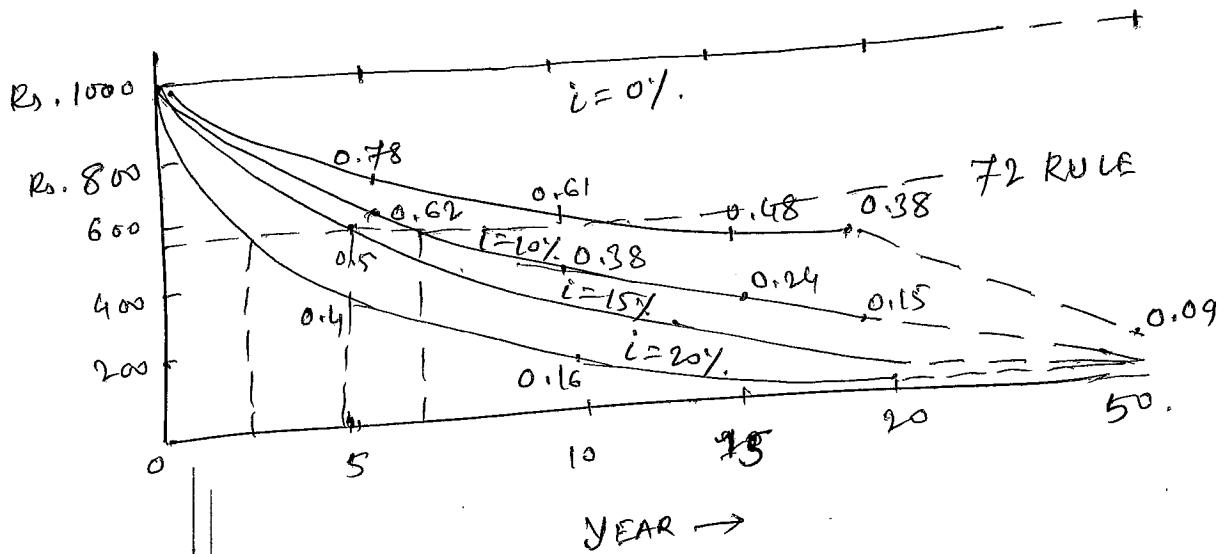


FIG. DEMAND AND SUPPLY CURVE

56.

72 RULE OF PRESENT WORTH :

The present worth of future amount drops off rapidly as the time between now and then increases, particularly at higher interest rates. The pattern of this increase in present value is as shown below:



Examination of curves suggests an interesting rule of thumb: The 72 rule indicates the approximate no. of years N at which PW is one-half the FW (future worth) at the annually compounded interest rate i :

$$\text{72 Rule: } N = \frac{72}{(i)(100)}$$

5c.

Given data:

$$F = \text{Future Sum} = \text{Rs. } 50,00,000/\text{r}$$

$$N = \text{Duration} = 10 \text{ years.}$$

$$i = \text{Interest rate} = 12\% \text{ (Compounded annually)} \\ = 0.12$$

To find,

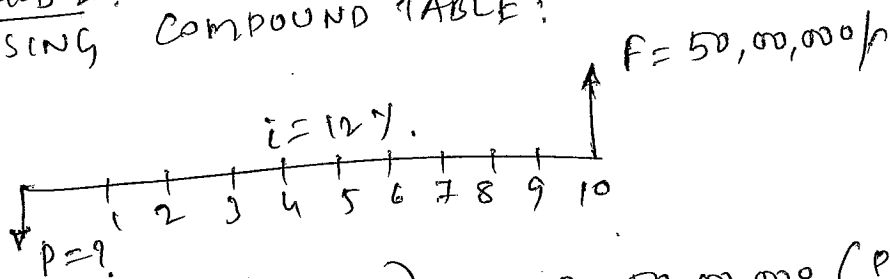
$$P = \text{Single payment investment} = ?$$

Solution: METHOD 1: (Formula Method)

$$P = \frac{F}{(1+i)^N} = \frac{50,00,000}{(1+0.12)^{10}}$$

$$P = \text{Rs. } 16,10,305/\text{r} \quad (\text{ANS.})$$

METHOD 2:
By USING COMPOUND TABLE:



$$P = F (P/F, i, n) \text{ or } P = 50,00,000 (P/F, 12\%, 10)$$

$$P = 50,00,000 (0.3220)$$

$$P = 16,10,000/\text{r} \quad (\text{Ans})$$

6 a. ENGINEERING ECONOMICS:

Engineering economics deals with methods that create and enable one to take economic decisions towards minimising the cost and/or maximising benefits to business organization.

MICROECONOMICS: This is the study of the markets, it focuses on supply that determines the price level of economy. It uses the bottom-up strategy to analyse the economy. Microeconomics tries to understand the human choices and allocation of sources. It doesn't decide what are the changes taking place in the market, instead, it explains why there are changes happening in the market. The key role of microeconomics is to examine how a company could maximise its production and capacity, so that it could

lower the prices and compete. The key factors of microeconomics are:

- (i) Demand, supply and equilibrium
- (ii) Production theory
- (iii) Costs of production
- (iv) Labour economics.

MACROECONOMICS: It is a branch of economics that depicts economy as whole some approach. It is measured by nation's total manufacture and the degree of employment with certain features like cost prices, wage rates, rates of interest, profits etc. The important concepts covered under macroeconomics are as follows:

- (i) Capitalisation
- (ii) Investment expenditure
- (iii) Revenue.

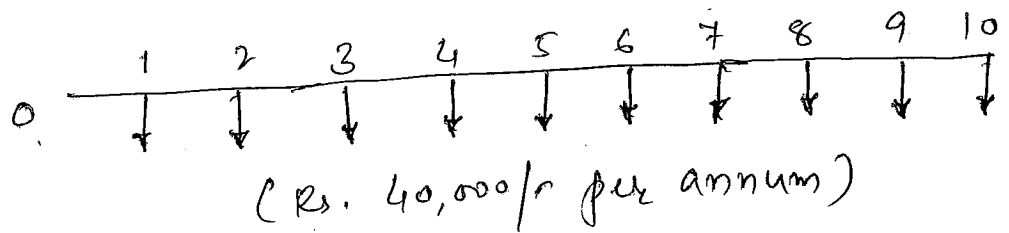
66.

Given data:

A man plans to build house,

 $A = \text{Investment per year} = \text{Rs. } 40,000/\text{r}$ $N = 10 \text{ years.}$ $i = 12\% \text{ (Compounded annually)}$ To find, The maturity Value (F) = ?

Solution:



$$F = A \left[\frac{(1+i)^N - 1}{i} \right]$$

$$= 40,000 \left[\frac{(1+0.12)^{10} - 1}{0.12} \right]$$

$$F = 7,01,949 \quad \text{ANS.}$$

The matured value of fund accumulated after 10 years is, Rs. 7,01,949/r

7 a. FUTURE WORTH METHOD COMPARISON:

The equivalence concept that a present worth can be translated to a future worth at any given time at a given interest rate. The future worth of an alternative can be calculated in view of the MARR and compared with do-nothing option.

If $FW > 0$ the alternative would be recommended.

Attention to scarce cash flows may yield more accurate estimates of receipts and disbursements because thinking tends to be current Rupees. Because the purchasing power of a unit of currency is eroded by inflation, future worth calculations are frequently utilised in escalation analyses, for evaluating the effects of inflation. The future worth at any time can be calculated

$$\text{by, } FW = PW(F/P, i, N)$$

$$FW = PW(1+i)^N$$

76. IRR (INTERNAL RATE OF RETURN) :

The IRR is best known and most widely used rate of return method, and the discounted cash flow method. The IRR, represented by 'i' is the rate of interest earned by an alternative investment on the unrecovered balance of an investment. (For example, the internal rate of return can be calculated by equating the annual, present or future worth of cash flows to zero and solving for the interest rate in this manner results in polynomial equation that is a function of i , which may result in multiple roots of the equation.

The IRR is the interest rate at which the present worth of the cash flows of a project is zero, or, to restate this in another way. The rate which when employed in computing the present worth of all costs and present worths of all returns will make them equal.

MARR (MINIMUM ACCEPTABLE RATE OF RETURN)

The minimum acceptable rate of return is also known as the minimum alternative rate of return.

- It is the device designed to make the best possible use of limited resource i.e., money.
- Rates vary widely according to the type of organizations and they vary even within the organizations. These variations usually reflect the risk involved.

Exeg.: The rate of return required for the cost reduction proposals may be lower than that required for research and development projects in which there is less certainty about prospective cash flows.

- MARR is to be used with constant rupee, is an inflation free interest rate that represents the earning power of capital when inflation effects have been removed.

7 c. Given data:

PARTICULARS	MACHINE A	MACHINE B
1. Initial Investment	30,000/r	42,000/r
2. Annual receipts	20,000/r	26,000/r
3. Annual Expenditures	5,500/r	7,000/r
4. Economic Life	4 years	4 years.

To find, which machine has the fastest payback period?

Solution:

	M/c A	M/c B
P =	30,000/r	42,000/r
R =	20,000/r	26,000/r
C =	5,500/r	6,500/r
n =	4 years.	

$$\text{Payback Period} = \frac{P}{R - C}$$

$$\text{For M/c A} = \frac{30,000/r}{20,000/r - 5,500/r} = \underline{2.06}$$

$$\text{For M/c B} = \frac{42,000/r}{26,000/r - 6,500/r} = \underline{2.21}$$

PAY BACK PERIOD OF MACHINE A is FASTEST.

8 a. Given:

Generated fund = Capital = Rs. 10,00,00,000/-

Annual Maintenance = AMC = Rs. 10,00,000/-

Repair/Painting cost = PAR = Rs. 12,00,000/- (Every 10 years)

$i = 6\%$

(Assume no taxes & inflation)

Solution: Given F, find A.

$$A = F \left[\frac{i}{(1+i)^n - 1} \right]$$

$$A = 12,00,000 \left[\frac{0.06}{(1+0.06)^{10} - 1} \right]$$

$$A = \underline{91,041/-}$$

$$TAC = 10,00,000 + 91,041/- = 10,91,041/-$$

$$P = \text{Capitalized cost} - (TAC/i)$$

$$P = 10,00,00,000 - \left(\frac{10,91,041}{0.06} \right)$$

$$P = \underline{8,18,15,975/-}$$

So, Initial Construction cost = Rs. 8,18,15,975/- Ans.

86.

METHODS OF COMPARING THE WORTHINESS OF

ENGINEERING PROJECTS :

- (i) Present Worth Method
- (ii) Future Worth Method
- (iii) Annual Equivalent Method.
- (iv) Rate of Return Method.
- (v) Payback Comparison Method

(i) PRESENT WORTH METHOD: Present worth comparisons are made between coterminated proposals, to ensure equivalent outcomes. Cotermination means that the lives of the involved assets end at the same time. When assets have unequal lives, the time horizon for an analysis can be set by a common multiple of asset lives or by a study period that ends with the disposal of all assets.

Net present worth, the difference between the presents worths of benefits and of costs, is the most widely used present worth model. A capitalized cost model is used when an asset is assumed to have infinite life.

The present worth of cash flow over time is its value today, usually represented as time 0 in a cash flow diagram. Two general patterns are apparent in present-worth calculations: Present worth equivalence and net present worth.

9 a. COMPONENTS / CAUSES OF DEPRECIATION :

- (i) Physical Depreciation
- (ii) Usage
- (iii) Abnormal occurrences.
- (iv) Technological development and changes.
- (v) Sudden failure
- (vi) Depletion.

(i) Physical Depreciation:

- (a) Normal physical wear and tear due to friction
- (b) Lack of maintenance
- (c) Passage of time.

(ii) Usage: By usage any product with parts having relative motion lose their efficiency.

(iii) Abnormal occurrences: Accidents, defects in m/c, excessive wear and tear etc.

(iv) Technological development: New equipment may supersede older one. Change in manufacturing methods.

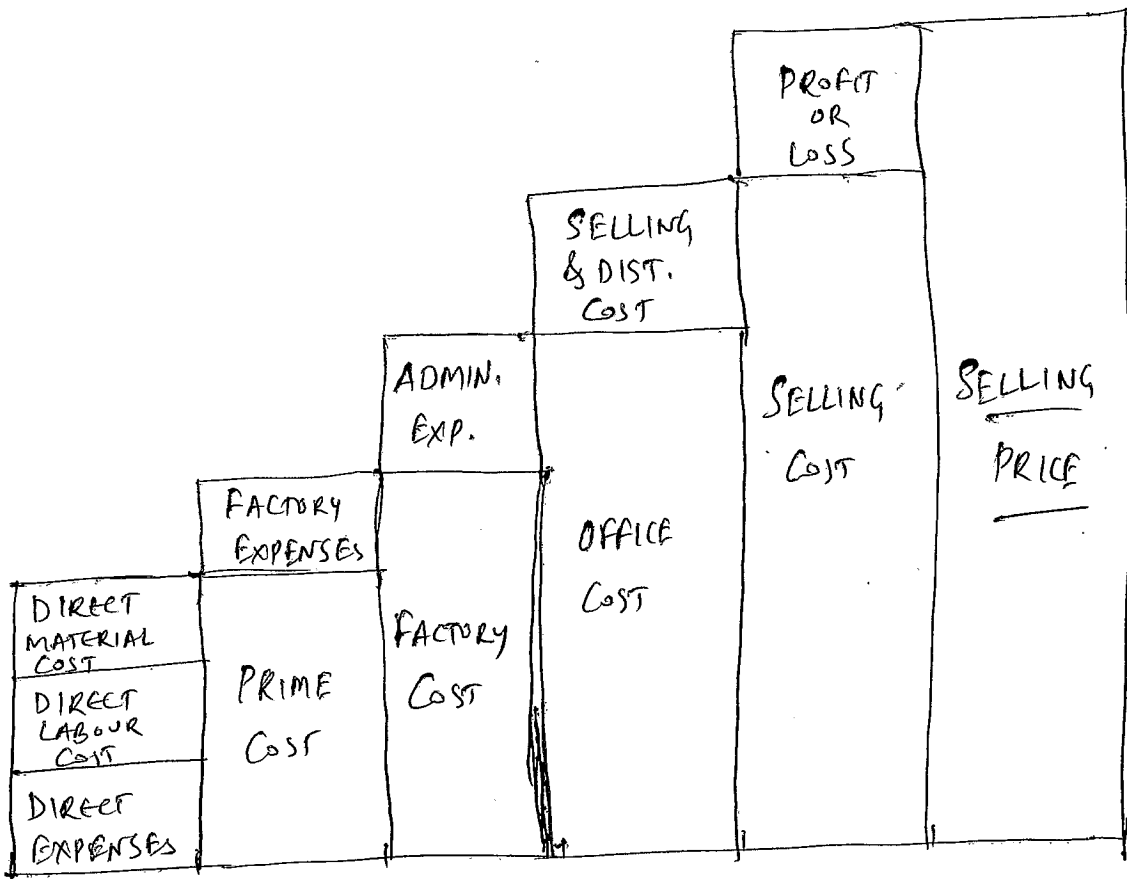
(v) Sudden failure: This refers to sudden or catastrophic loss in value due to inherent characteristic of equipment.

(vi) Depletion refers to consumption of exhaustible resources.

96. SELLING PRICE:

Selling price is fixed on the basis of cost incurred for a product while manufacturing.

The following diagram shows the details required for calculation of selling price.



96.

Given:

Investment made = Rs. 8,000/-

Salvage value of pen machine = Rs. 1,000/-
(After five years)To find, (i) Straight line depreciation expense = ?

(ii) Book value at the end of each year

(iii) Depreciation fund after 4th year.

Solution:

$$(i) \text{ Depreciation per year} = \frac{C-R}{N} = \frac{8000-1000}{5}$$

$$= \text{Rs. } 1400/- \quad \boxed{\text{ANS}}$$

(ii) Book value at the end of each year:

No. of Year	Cost	Dep./year	Book Value.
1	8000	1400	6600
2	6600	1400	5200
3	5200	1400	3800
4	3800	1400	2400
5	2400	1400	1000

$$(iii) \text{ Depreciation fund after 4 years} = 1400 \times 4 = \text{Rs. } 5600/-$$

$$\boxed{\text{ANS}}$$

10 a. DIFFERENCE BETWEEN ESTIMATION AND COSTING ?

(i) Estimation is an act of finding - the cost, which is likely to be incurred on the manufacture of an article, before it is actually manufactured. Thus, it is a calculation of a probable cost of an article before the manufacture starts. It also includes predetermination of the quantity of material, labour required etc. While Costing is the determination of actual cost of the product by adding various elements of expenses incurred.

(ii) Estimation requires a highly technical knowledge hence, an estimator is basically an engineer and Costing requires the knowledge of accounts and so Costing is done by accountants.

(iii) Estimation forecasts about the probable cost and hence one can know before the manufacture that the manufacturing of the product shall be profitable or not, and whether one should manufacture it or not, but costing tells after the manufacture about the profitability of the product.

10 b.

OBJECTIVES OF COSTING:

- (i) To determine the cost of each article.
- (ii) To determine the cost incurred during each operation, to keep control over workers wages.
- (iii) To provide information to ascertain the selling price of the product.
- (iv) To supply information for detection of wastages.
- (v) It helps in reducing the total cost of manufacture.
- (vi) To help management in decision making.
- (vii) To compare the actual cost with the estimated cost of the component.

10 c.

Given data:

Density of material = 7.2 gm./cc.

Cost of molten metal = Rs. 20/kg.

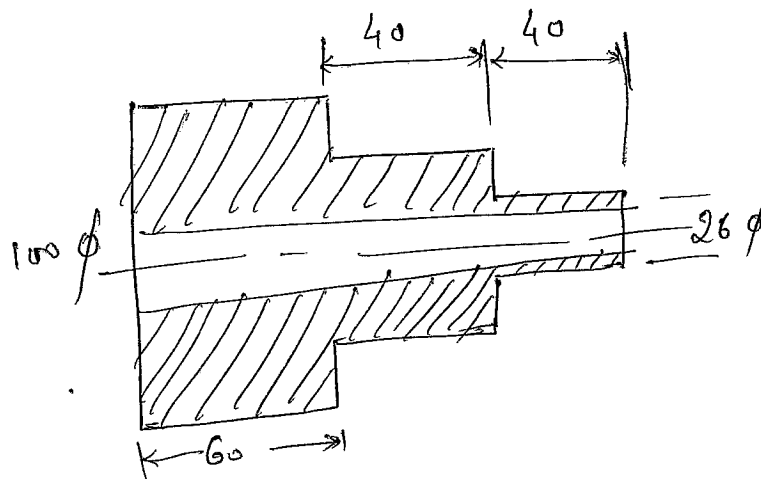
Process Scrap = 20% of net weight.

Scrap return value = Rs. 6/kg.

Administrative overheads = Rs. 30/hour.

Sales overheads = 20% of factory cost.

Profit = 20% of factory cost.

Other Expenditures:

OPERATION	TIME/PIECE (min.)	LABOUR COST (Rs.)	SHOT OVERHEADS (Rs./hour)
Moulding & Poring	15	20	60
Shot blasting	5	10	40
Fettling & Inspection	6	10	40

Solution:

$$i) \text{ Volume} = \frac{\pi}{4} D^2 \times L = \left(\frac{\pi}{4} \times 100^2 \times 60 \right) + \left(\frac{\pi}{4} \times 80^2 \times 40 \right) + \left(\frac{\pi}{4} \times 60^2 \times 40 \right)$$

$$= \underline{711 \text{ cm}^3}$$

$$ii) \text{ Weight} = \text{Volume} \times \text{Density} = 711 \times 7.2 = \underline{5120 \text{ gm.}}$$

$$= \underline{5.12 \text{ kg}}$$

$$iii) \text{ Total weight of material} = 5.12 + 1.04$$

$$= \underline{6.144 \text{ kg}}$$

(where, 1.04 is 20% Scrap)

Labour cost per piece:

$$i) \text{ Moulding and packing} = \frac{15}{60} \times 20 = \text{Rs. } 5/\text{piece.}$$

$$ii) \text{ Shot blasting} = \frac{5}{60} \times 10 = \text{Rs. } 0.833/\text{piece.}$$

$$iii) \text{ Fetting \& Inspection} = \frac{6}{60} \times 10 = \text{Rs. } 1/\text{piece.}$$

$$\text{Cost of material} = 6.144 \text{ kg} \times \text{Rs. } 20/\text{kg} = \text{Rs. } 122.88$$

$$\text{Scrap return value} = 1.024 \text{ kg} \times \text{Rs. } 6/\text{kg} = \text{Rs. } 6.144$$

$$\text{Direct material cost} = 122.88 - 6.144 = \text{Rs. } 116.736$$

$$\text{Direct labour cost/piece} = \text{Moulding} + \text{shot blasting} + \text{Fetting}$$

$$= 5 + 0.833 + 1$$

$$= \underline{\underline{\text{Rs. } 6.833}}$$

Overheads:

$$\text{Moulding} = \frac{15}{60} \times 60 = \text{Rs. } 15/\text{piece.}$$

$$\text{Shot blasting} = \frac{5}{60} \times 40 = \text{Rs. } 3.33/\text{piece.}$$

$$\text{Fettling} = \frac{6}{60} \times 40 = \text{Rs. } 4/\text{piece.}$$

$$\text{Factory overheads} = 15 + 3.33 + 4 = 22.33$$

$$\text{Administration Overheads} = \frac{15 + 5 + 6}{60} = 0.433$$

→ DMC = Direct Material Cost
 → DLC = Direct Labour Cost → PC = Prime Cost.

$$\text{Prime Cost} = \text{DMC} + \text{DLC} = 116.736 + 6.833 = 123.569$$

$$\begin{aligned} \text{Factory Cost} &= \text{PC} + \text{Factory Expenses.} = 122.569 + 22.33 \\ &= \underline{\underline{144.899}} \end{aligned}$$

$$\begin{aligned} \text{Office Cost} &= \text{Factory Cost} + \text{Admin Overheads} = 144.899 + 12 \\ &= \underline{\underline{158.899}} \end{aligned}$$

$$\text{Sales overhead} = 20\% \text{ of factory cost} = \frac{20}{100} \times 144.899 = 28.979$$

$$\begin{aligned} \text{Total Cost} &= \text{Office Cost} + \text{Sales overheads} \\ &= 158.899 + 28.979 \\ &= \underline{\underline{\text{Rs. } 197.87}} \end{aligned}$$

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