



## MID-TERM EXAMINATION

March - 2020  
Even Semester

PAPER CODE- HU-202

## TITLE OF PAPER- Engineering Economics

Max. Marks: 25

Time: 1.30 Hours

Note: Attempt any five questions.

All questions carry equal marks.

FOURTH SEMESTER  
MID-SEMESTER EXAMINATION

CHU 202: ENGINEERING ECONOMICS

March-2019

Time: 1 Hour 30 Minutes

Note : All questions are compulsory.

Total No. of Pages- One

Max. Marks: 25

Roll No. ....

IIIrd Semester

B. Tech -(BT/CO/EC/EE/EL/IT/SE/ENE)

MID SEMESTER EXAMINATIO2017-18 (Odd)

September -2017

IIU - 201 - Engineering Economics

Time: 1 Hours30 Minutes

Max Marks: 25

Note: Answer all questions.

Assume suitable missing data, if any

Total no. of Pages: 01

Roll no. ....

## VI SEMESTER

B.Tech.

## MID TERM EXAMINATION

March-2023

## HU302 Engineering Economics

Time: 1:30 Hours

Max. Marks: 25

Note : All questions are compulsory.

All questions carry equal marks.

Assume suitable missing data, if any.

Total No. of Pages: 1

Roll No. ....

## SECOND SEMESTER

B.E. (ME/PE)

## MID SEMESTER EXAMINATION MARCH 2005

## ME/PE-111 ENGINEERING ECONOMICS &amp; ACCOUNTANCY

Time: 1 Hour 30 Minutes

Max. Marks: 20

Note : Attempt ALL questions.

Assume suitable missing data, if any.

Total No. of Pages: 2

1st Sem.  
ELEMENTARY EXAMINATION

Roll No. ....

S.Tech.IITI

FEB-2018

Time: 3:00 Hours

Max. Marks: 70

Note : Answer any FIVE questions.

Assume suitable missing data, if any.

All questions carry equal marks.

November 2011

## CE/EE/EP/EL/ME/CS/SL-2006-Engineering Economics

Max. Marks: 70

Delhi Technological University  
B. Tech. Third Semester

Time: 3 Hour

Note: Answer any five questions.  
Assume suitable missing data, if any  
Use of interest rate table is allowed

Total No. of Pages: 2

B.Tech.

(Nov -2016)  
END SEMESTER EXAMINATION  
BT/EC/EE/EL/EN/CO/TSE -201- ENGINEERING ECONOMICS  
Time: 3 Hour

Note: Answer any five questions. Assume suitable missing data, if any.

Total No. of Pages: 3

FOURTH SEMESTER

## END SEMESTER EXAMINATION

## CE/ET/EC/PE/ ENE/PT/BT - 210 ENGINEERING ECONOMICS

Max. Marks: 70

Time: 3:00 Hours

Note : Answer any FIVE questions.  
Assume suitable missing data, if any.

## 2. Differentiate between following:

2.a Microeconomics and Macroeconomics 2019 M

Q3. Difference between Microeconomics and macroeconomics 2019 M5

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3. What do you mean by Microeconomics? How it is different from Macroeconomics?

2018 M [5]

2. Differentiate between following:

[a] Micro Economics and Macro Economics 2012 M

1. What do you mean by macro economics? 2001 M

2

4. a) Discuss the difference between Microeconomics and Macroeconomics. 2020 S

(5) As 'Micro' means small, Microeconomics deals with the economic behaviour of small entity; it may be a consumer or a firm. Some topics covered under this are Consumer behaviour, Law of Demand, Production Function, Factors of production, Product Pricing, Market

The word 'Macro' means large and Macroeconomics deal with the study of the aggregate or average covering the entire economy viz. national income, aggregate function, general price level etc.

It can be referred to as looking the economy from above.

Some of the issue it deals with are as follows:

National income and employment, Saving and investment, Trade Cycle, General Price Level, Inflation, Development and Growth, Distribution of national income b/w factors of Production, Monetary and Fiscal System of an economy

## MICROECONOMICS

→ It deals with the economic behaviour of small entity like firm.

## MACROECONOMICS

It deals with economic behaviour of large entity like industry or nation.

→ Economic decision taken under micro is under the control of the individual regarding when the decision is to be taken as, how much has to be purchased in under the control of us.

All of us are affected by macroeconomic decisions but it is not under the control of any one of us as, we all are affected by ITP of GOI but none of us can change it acc to consumer's customer.

1. What do you mean by Economics? Discuss its relevance for engineering students. 2023 M

[2+3=5]  
[CO#i&3]

- Fill up the blanks: 2005 M
- Price elasticity of Coca Cola is greater than one.
  - 10th Five year plan is in progress in India. (Ans 10)
  - Demand for normal goods increases with increase in income.
  - Variable cost is directly proportionate to output.
  - Cross elasticity of demand for substitute goods are positive.
  - Economic goods are scarcer in supply than the demand.

3

Date: / /
Page No.:

1. Fill up the blanks: 2018 M 10\*1/2=5
- Wood is a free good in the forest but an economic good near construction site.
  - Opportunity cost is the cost of the next best option.
  - In Oligopoly, there are small number of firms.
  - The burden of tax falls on the same person who pays tax in case of direct tax.
  - Subsidy increases purchasing power in the hands of the people.
  - Cost of last unit produced is called marginal cost.
  - Value of money decreases in Inflation.
  - Labour gets wages for its contribution in Production.
  - In case of Adverse Balance of Payment, value of Export is less than value of Import.

1. Fill in the blanks: 2018 M (5)

- Wood in a forest is a free commodity.
- Labour gets wages for its contribution in production.
- In perfect competition, there are large number of producers producing heterogeneous product.
- Cost of producing additional unit is called as marginal cost.
- Good and Services Tax (GST) is consumption tax.
- Reserve Bank of India is Central bank.
- Opportunity cost is the cost of the next best option.
- If value of export is less than import for a country, its Balance of Payment is known as Adverse Balance of Payment.
- In recession, demand of durable goods decreases.
- Dumping means selling goods at lower price in the foreign market than the domestic market.

P.T.O.

- 1/ Write True or False: 2012 M 3
- If cross elasticity of two goods x and y is positive, these goods are substitute goods. TRUE
  - In monopolistic competition, there is only one producer. FALSE
  - Producer gets interest for his contribution in production. FALSE
  - Two factors of production i.e. labour and capital can be substituted for each other upto certain extent. TRUE
  - During inflation, value of money decreases. TRUE
  - In indirect Tax, burden of tax falls on the same person who pays tax. TRUE

1. Write down 'True and 'False' 2012 M

- [a] When other things remain same, demand of a product is inversely related to its price. **TRUE**
- [b] Cross Elasticity of Demand for substitute goods are positive. **TRUE**
- [c] There is only one firm in Monopolistic Competition market. **FALSE**
- [d] Burden of tax falls on the same person who pays tax in case of Indirect Tax. **TRUE**
- [e] Dr. Manmohan Singh is the Chairman of the Planning Commission of India. **TRUE** (in 2012)
- [f] When price increase, value of money also increases. **FALSE**

3

1. Write 'True' or 'False': 2019 M

(5)

- a. Economic goods are short in supply than the demand. **TRUE**
- b. Wood in a forest is a non-exhaustible good. **FALSE**
- c. Labour gets rent for its contribution in production. **FALSE**
- d. Marginal utility remains same with consumption of successive units of a product. **FALSE**
- e. Value of money decreases under inflation. **TRUE**
- f. Reserve Bank of India is a Nationalised Commercial Bank. **FALSE**
- g. Opportunity cost is the cost of the next best option. **TRUE**
- h. If value of export is more than import of a country, its Balance of Payment is known as Adverse Balance of Payment. **FALSE**
- i. In case of Progressive taxation, rate of tax increases with increase in income of the tax payer. **TRUE**
- j. Dumping means selling goods at the same price in the foreign market as in the domestic market. **FALSE**

Q1. Write 'True' or 'false' 2019 M

10\*1/2=

- (a) Goods and service tax is a direct tax. **FALSE**
- (b) Cross elasticity of complementary goods are positive. **FALSE**
- (c) Complementary goods are those goods which can be used in each other's place. **FALSE**
- (d) Labor gets wages for their contribution in production. **TRUE**
- (e) Price elasticity is greater than one for necessary goods. **FALSE**
- (f) There are few producers in the monopolistic condition market. **FALSE**
- (g) In case of adverse balance of payment, value of export is more than the value of import. **FALSE**
- (h) Wood in a forest is a free good. ?
- (i) Cost of the next best option is the opportunity cost of best option. **TRUE**

7. Pick out the right answer

2001 M

(1x4=4)

[c]

Efficient allocation of resources is likely to be achieved in

- [a] Which of the following is NOT a characteristic feature of Capitalism.  
 (i) Centralised Planning  
 (ii) Private ownership of factors of production  
 (iii) Class conflict
- [b] A National Wage Policy in India is not possible due to :  
 (i) Diversity in labour efficiency  
 (ii) Existence of many states  
 (iii) Differences in standard of living
- [c] Cost of machinery is  
 (i) Average Cost  
 (ii) Fixed Cost  
 (iii) Variable Cost

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- Q1. Select the correct answer from the given options: 2019 M (chu) [1x5]
- what to produce
  - how to produce
  - how to maximize private profit
  - for whom to produce
- Q2. What would shift the market demand curve for digital televisions to the right?  
 (a) an improvement in manufacturing processes reducing costs  
 (b) an increase in the tax levied on digital televisions  
 (c) successful advertising campaign by suppliers  
 (d) increased unemployment leading to lower incomes

- Q2. Write short note on any four of the following: 2019 M (chu)
- Maximal utility

- iii. Law of demand is Prepared by Madhav Gupta (2K21/CO/262)  
 (a) income and price of commodity  
 (b) price and quantity demanded of a commodity  
 (c) income and quantity demanded  
 (d) quantity demanded and quantity supplied
- iv. Which of the following is not the property of indifference curve?  
 (a) IC is Convex to origin  
 (b) Two IC can cut each other  
 (c) Higher IC means higher satisfaction  
 (d) IC is downward sloping left to right
- v. The price elasticity of demand is a negative number this means:  
 a) Demand is price elastic  
 b) Demand is price inelastic  
 c) The demand curve is downward sloping  
 d) An increase in income will reduce the quantity demanded

Marginal utility is the added satisfaction a consumer gets from having consumed one more unit of a good or service

i.e.

It is the utility derived from the last unit consumed mathematically:

$$MU = \frac{d(TU)}{dx}$$

TU → total utility

n → no. of units consumed

Eg.)	Units consumed	TU	MU
	1	200	-1200
	2	250	50
	3	275	25

1. Fill in the blanks: 2017 M [5]

- Sand near construction site is a \_\_\_\_\_ commodity.
- Labour gets wages for its contribution in production.
- In perfect competition, there are large number of producers producing homogenous product.
- Cost of producing additional unit is called as marginal cost.
- Good and Services Tax (GST) is indirect tax.
- State Bank of India is commercial bank.
- Opportunity cost is the loss of the next best option.
- If value of export is more than import for a country, its Balance of Payment is known as Surplus Balance of Payment.
- Value of money decreases in case of Inflation.
- Cross Elasticity of Demand is negative in case of complementary goods.

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VII Semester

B.Tech.

Mid-Term Examination

September' 2023

HU 301 Engineering Economics

Time- 1.30 hrs

Marks- 25

Note: 1. All questions are compulsory.  
 2. All questions carry equal marks.  
 3. Assume missing values, if any

- Q.1 (a) A consumer consumes only two goods X & Y both priced at 3 per unit. If the consumer chooses a combination of these two goods with the marginal rate of substitution equal to 3. Is the consumer in equilibrium? Give reasons. What will a rational consumer do in this situation?

2022E

[CO:1][5 Marks]

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$$\text{Given, } P_x = 3$$

$$P_y = 3$$

$$\therefore \text{for equilibrium, } MRS_{xy} = \frac{P_x}{P_y} = \frac{3}{3} = 1$$

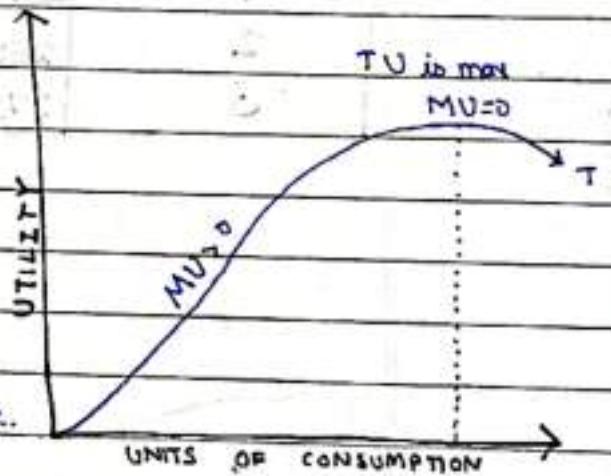
but  $MRS_{xy} = 3$ , which is saying that consumer is not in equilibrium as  $MRS_{xy} \neq P_x/P_y$

Since,  $MRS_{xy} > P_x/P_y$ , the rational consumer will react to this by substituting X for Y so  $MRS_{xy}$  declines and becomes equal to price ratio.

- 2(i) Explain the law of diminishing marginal utility. Illustrate your answer with appropriate diagrams. Discuss also the assumptions and limitations of this law. 2018 E(16/17)

- Q5. Explain the law of diminishing marginal utility along with its assumptions. (Use [3] diagram) 2019 M(16/17)

The law states that as a person consumes more units of a good, the marginal utility with successive units of consumption of good decreases while the total utility increases at a falling rate, if other things remain same. When  $MU=0$ , TU becomes highest and beyond that point TU starts falling and  $MU \rightarrow -ve$ .



#### ASSUMPTIONS:

- All units of the good are homogeneous and they consume in std. units.
- There is no change in taste during consumption of good.
- There is no time gap b/w consumption of successive units of good (continuous consumption).
- Consumer is rational and he will not do anything, which will reduce total utility.

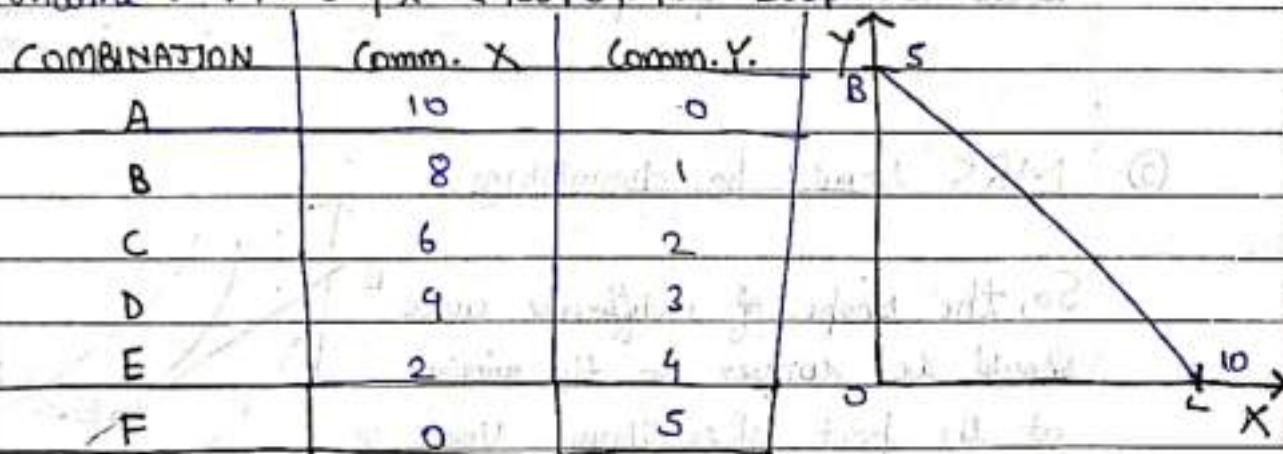
## LIMITATIONS

- The units being consumed are very small.
- The units being consumed are of diff. sizes.
- There are long breaks in b/w consuming the units.
- The consumer is thinking or behaving irrationally, or is suffering from a mental illness or addiction.
- The units being consumed are a part of a collection or rare objects.

c) Budget line 2019M (CHND)

Budget line or Price line is a plot b/w 2 goods showing all possible combinations of 2 products that be purchased by a consumer with given income and price of 2 goods.

Ex:) Income : ₹ 1000 |  $X \rightarrow ₹ 100 \text{ per unit}$  |  $Y \rightarrow ₹ 200 \text{ per unit}$



$$\therefore P_x \cdot X + P_y \cdot Y = M$$

$$\left. \begin{aligned} \text{Ex:)} \quad 100 \times 10 + 200 \times 0 &= 1000 \\ 100 \times 8 + 200 \times 1 &= 1000 \\ \vdots \\ 100 \times 0 + 200 \times 5 &= 1000 \end{aligned} \right\} 100x + 200y = 1000$$

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Q6. Explain consumers' equilibrium through ordinal analysis. [2019 M(Chu)] [3]

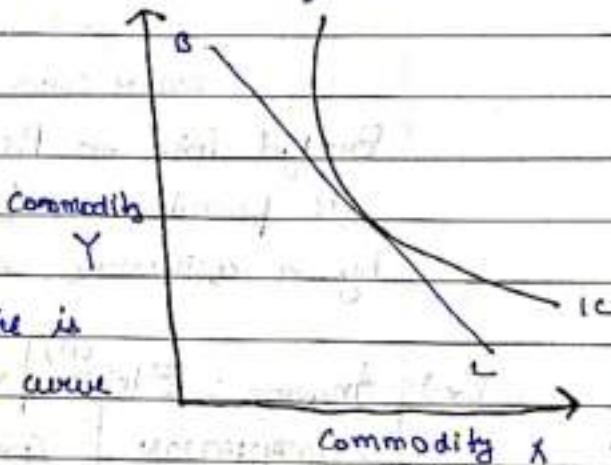
Consumer's equilibrium is a situation where a consumer gets maximum utility out of their limited income and they have no tendency to make any changes in expenditure.

### Conditions

- ① Marginal Rate of Substitution is equal to ratio of prices

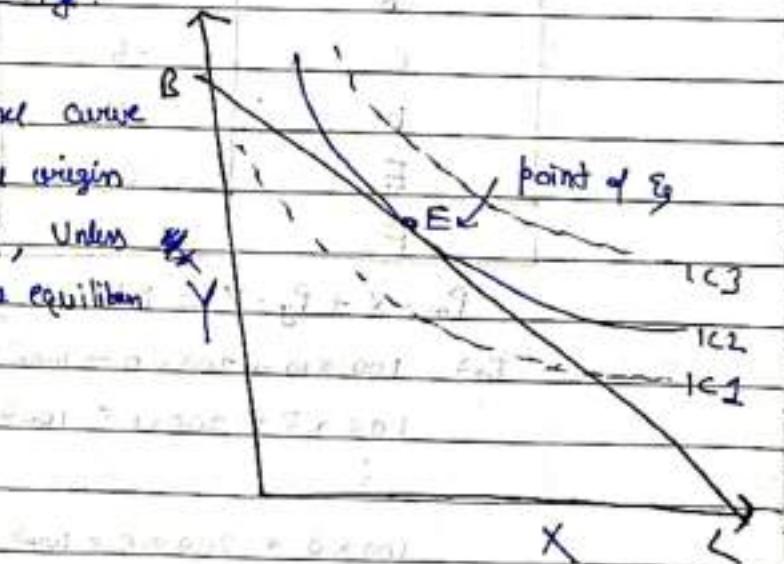
$$MRS_{xy} = \frac{P_x}{P_y}$$

It can be said that at point of equilibrium, the slope of budget line is equal to the slope of indifference curve.



- ② MRS should be diminishing.

So, the shape of indifference curve should be convex to the origin at the point of equilibrium. Unless MRS falls continuously, the equilibrium can't be reached.



Q2. (a) Explain the law of equi marginal utility and determine the consumer's equilibrium using given information [5 Marks] [CO: 1]

Price of X = Rs. 4

Price of Y = Rs. 5

Total money income = Rs. 35

No. of units consumed	MU <sub>X</sub>	MU <sub>Y</sub>
1	40	55
2	36	50
3	32	30
4	28	20
5	24	15
6	20	5

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### Assumption

i.) Cardinal Utility

ii.) Rational Consumer

iii.) No change in income

iv.) — price of comm

v.) — price of related good

vi.) — taste and preferences.

This law is based on the principle that of obtaining maximum satisfaction from a limited income by explaining the behaviour of a consumer when they consumes more than one commodity.

It states that:

"A consumer should spend his income in such a way on diff commodities, each commodity yields him equal marginal utility in order to get maximum satisfaction".

$$\frac{MU_A}{P_A} = \frac{MU_B}{P_B} = \frac{MU_C}{P_C} = \frac{MU_D}{P_D} = \dots$$

Given

$$P_X = 4$$

$$P_Y = 5$$

$$M = 35$$

∴ for consumer's eq.

$$\textcircled{1} \quad MU_X = MU_Y$$

$$\textcircled{2} \quad P_X Q_X + P_Y Q_Y = M$$

Given	#units	MU <sub>X</sub>	MU <sub>X</sub> (₹)	MU <sub>Y</sub>	MU <sub>Y</sub> (₹)
P <sub>X</sub> = 4	1	40	10	55	11
P <sub>Y</sub> = 5	2	36	9	50	10
M = 35	3	32	8	30	6
	4	28	7	20	4
	5	24	6	15	3
	6	20	5	5	1

∴ consumer's eq is attained by purchasing 5 units of X and 3 units of Y

3 Write short answer:

What do you mean by law of demand? 2012 M

Date: / /

Q1. (a) What is law of Demand? What are the exceptions to the law of demand? 2022 M [2.5 Marks]

The law of demand gives relation b/w price and quantity and it states that:

Keeping other factors constant, there is an inverse relation between price of commodity and its quantity demand.

Price Per Unit (₹)

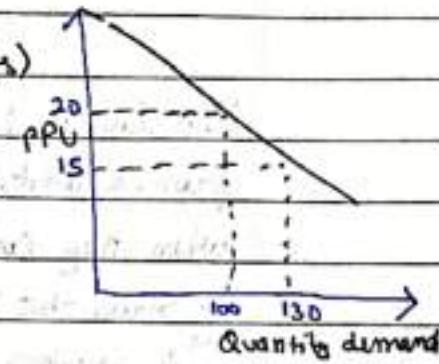
20

15

Quantity Demand (units)

100

130



Exceptions to law of demand:

1. Giffen Goods: These are inferior goods/low-quality goods like Dalda, jernal rice whose demand does not fall even if price falls.
2. Veblen Goods: These are luxury goods like precious metal and Motor or vehicles like Porsche where demand may increase with price.
3. Future expectation of Price Change:  
demand rises if price is expected to rise  
demand falls if price is expected to fall.
4. Essential or Necessary Products  
Cost of such products do not change with price. This may include things like salt and medicine etc.

# Q1 Price Elasticity of Demand and Cross Elasticity of Demand

2012 M

Difference between:

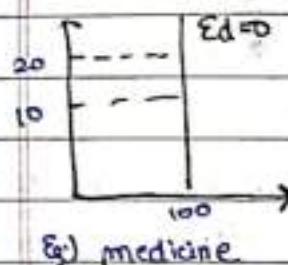
- (i) Price elasticity of demand and Cross elasticity of Demand. 2020 M  
 Q. What do you mean by Price Elasticity of Demand? Discuss. (5)  
 2018 M b) Price elasticity of demand 2019 M

Date: / /

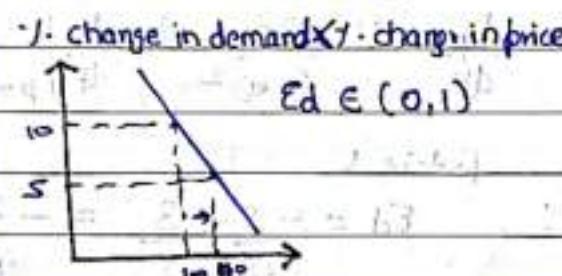
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Elasticity of demand means degree of response of demand. So, Price elasticity of demand is the degree of responsiveness of demand to change in price of the commodities.

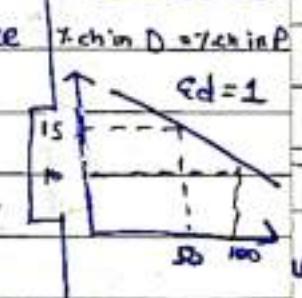
## i) Perfectly Inelastic PED



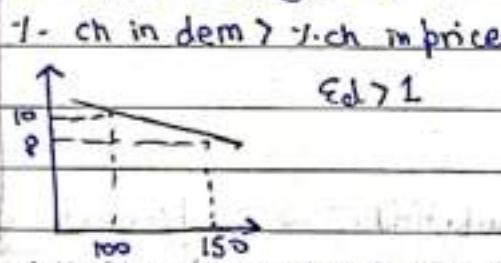
## ii) Less than unit elastic



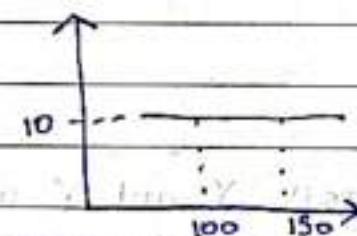
## iii) Unitary PED



## iv) More than unitary Elastic



## v) Perfectly Elastic (imaginary) Ed = ∞



- Q. Define price elasticity of demand and discuss various methods of measuring price elasticity of demand. 2018 E (CEEE)

### Methods of calc

#### a) % or proportionate method:

$$Ed = \frac{\% \text{ change in demand}}{\% \text{ change in price}} = \frac{\Delta Q/Q \times 100}{\Delta P/P \times 100} = \frac{\Delta Q \times P}{\Delta P \times Q}$$

#### b) total expenditure or total outlay method

#### c) Geometric / Point Method

#### d) Arc Method.

- Q. Find the price elasticity of demand for the demand function  $P = e^x$  and  $P = e^x/x$ . 2013 B

- 1 b i. If the demand law is given by  $x=20/(p+1)$ , find Elasticity of demand with respect to price at the point where  $p=3$ . 2011E
- 1 b ii. If the demand function is given by  $x=20/(p+1)$ , find the Price Elasticity of Demand at the point where  $p=3$ . 2011E

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2. If the demand law is  $x = \frac{20}{p+1}$ , find elasticity of demand with respect to price at the point where  $P=3$ . 2020M

- 3(b) If the demand law is given by  $x=20/(x+1)$ , find elasticity of demand with respect to price at the point when  $p=3$ . 2018S

$$Ed = \frac{\Delta q/q}{\Delta p/p} = \frac{dq}{q} \times \left(\frac{1}{dp/p}\right) = \frac{dq}{dp} \times \frac{p}{q} \quad \text{--- (1)}$$

 $\therefore \text{at } p=3$ 

$$\frac{q}{p} = \frac{20}{3+1} = 5 \Rightarrow q=5 \text{ and } p=3$$

$$\frac{dq}{dp} = -\frac{20}{(p+1)^2} \Rightarrow \frac{dq}{dp} \Big|_{p=3} = -\frac{20}{4 \times 4} = -\frac{5}{4}$$

putting

$$\therefore Ed = -\frac{5}{4} \times \frac{3}{5} = -\frac{3}{4} \quad (\text{negative sign indicate inverse relationship})$$

$$\Rightarrow |Ed| = \frac{3}{4}$$

- (b) Define Cross elasticity of demand and if cross price elasticity of demand for good X & Y is equal to -1.5 what is the relationship between goods X & Y. If the price of Y increases by 10% what is the percentage change in quantity demanded of X. 2022M

[2.5 Marks] [CO: 1]

If goods X and Y are substitutes or complements of each other, Cross Elasticity of Demand is defined as a ratio b/w the proportional change in quantity demanded of good X and the proportional change in the price of related good Y.

Thus indicating fluctuation in demand of one commodity with a change in price of other.

$$Ec = \frac{\Delta Q_x \times P_y}{\Delta P_y \times Q_x}$$

Given

$$\therefore Ec = -1.5$$

$$\Delta P_y / P_y = 1/10$$

$\therefore -1.5 = \gamma \cdot \text{change in demand of } X^{\text{ans}}$

$$1/10$$

$$\Rightarrow \text{ans} = -1.5 \times 10 \cdot \gamma.$$

$$\Rightarrow \text{ans} = 15 \cdot \gamma.$$

- 2(a) What do you mean by Price Elasticity of Demand? How it is different from Cross Elasticity of Demand? Also discuss significance of Price Elasticity of Demand. 2019 E

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- 1(a) Discuss in detail Price Elasticity and Cross Elasticity of Demand. Also discuss their relevance in business. 2019 S

### Price EOD

It measures the responsiveness of the quantity demanded of a good to change in its own price, all else being equal.

$$PED = \frac{\Delta q/p}{\Delta p/q}$$

Relevance: Helps firms set optimal pricing strategies by understanding how price changes impact demand for their own product.

### Cross EOD

It measures the responsiveness of the quantity demanded of one good to change in price of another related good, all else being equal.

$$XED = \frac{\Delta q_m \times p_y}{\Delta p_y \times q_m}$$

Useful for businesses to determine how changes in the price of related goods may affect the demand for their product and make strategic decisions accordingly.

- (b) Define cross-elasticity of demand and calculate cross-elasticity of demand for tea with respect to price of coffee if the price of coffee increases from Rs.10 to Rs.15 per 10 grams and as a result demand for tea increases from 20 tons to 30 tons per week, price of tea remaining constant. 2019 E (old)

Here,  $x \rightarrow$  tea

$y \rightarrow$  coffee

$$\therefore \Delta q_x = 10 ; q_x = 20$$

$$\Delta p_y = 5 ; p_y = 10$$

$\therefore$  Cross Elasticity of demand of tea w.r.t. price of coffee,

$$Ec = \frac{\Delta q_x}{q_x} \times \frac{p_y}{\Delta p_y} = \frac{10}{20} \times \frac{10}{5} = 1$$

It is unitary cross elastic.

1(b) Below is given a demand equation;

$$Q = -6P + 4000$$

Calculate price elasticity of demand if price is (i) Rs. 4 (ii) Rs 10 and (iii) Rs. 15. Is the demand at these prices elastic or inelastic?

2018 S 2

3(b) Below is given a demand equation;

$$Q = -6P + 4000$$

Calculate price elasticity of demand if price is (i) Rs. 4 (ii) Rs 10 and (iii) Rs. 15. Is the demand at these prices elastic or inelastic?

2019 S | 2019 E

2

when  $Q = 0$ ,

$$-6P + 4000 = 0 \Rightarrow P_1 = \frac{4000}{6} = 666.7$$

(ii)

$$\therefore \epsilon_P = \frac{P_2}{P_2 - 666.7} = \frac{\Delta Q \times P}{Q \Delta P} = \frac{P_2}{(P_2 - P_1)} \times$$

(i)

$$P_2 = \text{Rs } 4 \Rightarrow Q =$$

$$\epsilon_P = \frac{4}{4 - 666.7} = -0.00603$$

(ii)

$$P_2 = \text{Rs } 10$$

$$\epsilon_P = \frac{10}{10 - 666.7} = -0.01522$$

(iii)

$$P_2 = \text{Rs } 15$$

$$\epsilon_P = \frac{15}{15 - 666.7} = -0.02301$$

Demand is almost inelastic in all cases.

[b] If demand function for two products  $X_1$  and  $X_2$  are given by

$$X_1 = P_1^{-0.11} e^{a_{11}P_2 a_1}$$

$$X_2 = P_2^{-0.22} e^{a_{22}P_1 a_2}$$

Show nature of both products  $X_1$  and  $X_2$ .

2011 E

4

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c) Following are the demand functions for two commodities  $x_1$  and  $x_2$ :

$$x_1 = p_1^{-1.7} p_2^{0.8}$$

$$x_2 = p_1^{0.5} p_2^{-0.2}$$

2013 E

Determine whether the commodities are complementary or competitive.

$$x_1 = p_1^{-1.7} p_2^{0.8}$$

$$x_2 = p_1^{0.5} p_2^{-0.2}$$

$$\therefore \frac{\partial x_1}{\partial p_2} = 0.8 > 0$$

$$\therefore \frac{\partial x_2}{\partial p_1} = \frac{0.5}{p_1^{0.5} p_2^{0.2}} > 0$$

Hence the commodities are competitive as both are +ve.

b) Following are the demand function for the commodities  $q_1$  and  $q_2$ :

$$q_1 = p_1^{-1.3} p_2^{-0.7}$$

2020 S

$$q_2 = p_1^{0.4} p_2^{-4.5}$$

Determine whether the commodities  $q_1$  and  $q_2$  are complementary or competitive.

$$q_1 = p_1^{-1.3} p_2^{-0.7}$$

$$q_2 = p_1^{0.4} p_2^{-4.5}$$

$$\therefore \frac{\partial q_1}{\partial p_2} = \frac{-0.7}{p_1^{-1.3} p_2^{-1.7}} < 0$$

$$\therefore \frac{\partial q_2}{\partial p_1} = \frac{0.4}{p_1^{0.4} p_2^{0.5}} > 0$$

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Hence, they are neither competitive or complementary,  
no relation

- 3.b The demand for two commodities are given by:

$$X_1 = P_1^{-1.2} P_2^{0.5}$$

$$X_2 = P_1^{0.3} P_2^{0.8}$$

Find out whether the two commodities  $X_1$  and  $X_2$  are competitive or  
complementary.

2

yu

$$X_1 = P_1^{-1.2} P_2^{0.5}$$

$$X_2 = P_1^{0.3} P_2^{0.8}$$

$$\therefore \frac{\partial X_1}{\partial P_2} = \frac{0.5}{P_1^{1.2} P_2^{0.5}} > 0$$

$$\frac{\partial X_2}{\partial P_1} = \frac{0.3}{P_1^{0.7} P_2^{-0.2}} > 0$$

Hence, they are competitive products as both the

- 2(a) Explain the relationship between Average Revenue, Marginal Revenue and Price elasticity  
2018 E(odd)

- 2(a) Define price elasticity of demand and discuss the relationship between average revenue (AR), marginal revenue (MR) and price elasticity. 2018 S

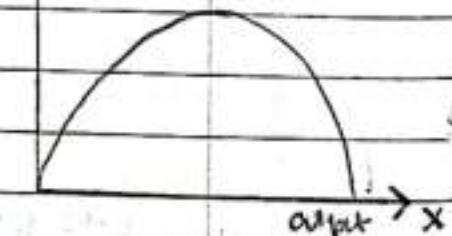
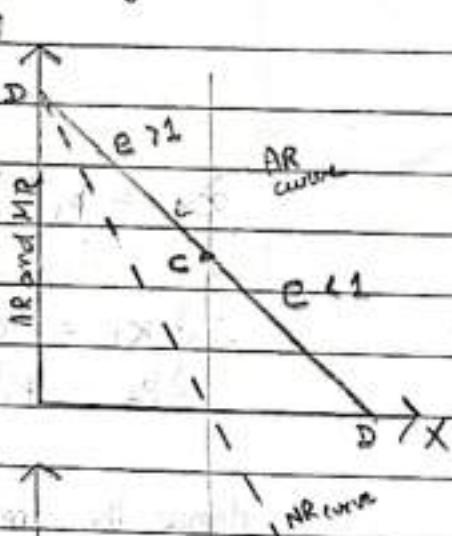
The relationship between AR, MR and e can be given as:

$$MR = AR(e - 1/e)$$

So, MR is directly proportional to AR

Let change in twice the proportion of AR

whereas MR is inversely proportional to elasticity of demand



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- Q3. When the price of a commodity falls from Rs. 20 per unit to Rs 16 per unit, its quantity demanded rises from 1000 units to 1160 units. Calculate and comment on the commodity's price elasticity of demand. [3] 2019/20 (CHU)

$$\Delta P_r = -4 ; P_r = 20$$

$$\Delta q = 160 ; q = 1000$$

$\therefore$  Price EoD,

$$E_d = \frac{\Delta q/q}{\Delta p/p} = \frac{160/1000}{-4/20} = \frac{-16}{100} \times \frac{5}{2} = -4$$

$$|E_d| = +0.8$$

$\therefore$  PED is less than unit elastic so "change in price is greater than change in demand".

#### 1) Substitute goods

Complementary goods are two or more goods which are required together collectively to fulfill human needs/wants, and single good has no useful utility.

Eg.) Car, petrol

Substitute goods are two or more goods which satisfy similar wants and can be used in each other's place.

Eg.) tea, coffee.

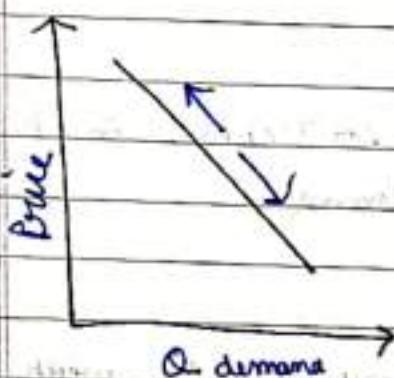
Coke, pepsi.

- Q7. What are the differences between shifting of demand curve and movement along demand curve? [3]  
2019/20 (CNU)

Movement along the demand curve is caused by a change in the commodity's price, whereas a shift is caused by a change in one or more factors other than ~~demanded~~ price.

There is a change along the curve with movement in the demand curve. However, in the shift in the demand curve, there is a change in position of curve.

### MOVEMENT ALONG

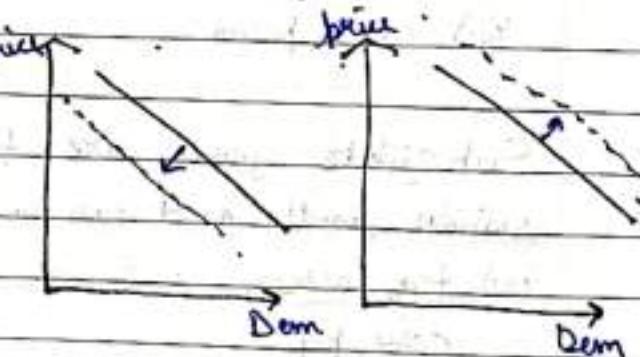


→ upward movement indicates a decrease in demand i.e. a decrease due to a price increase

→ downward movement indicates an increase in demand i.e., demand for the product or service rises as price decreases.

### SHIFT

→ Rightward Shift denotes a rise in demand at the same price due to a favourable shift in non-price factors.



→ Leftward Shift is when the price remains same, but other factors move unfavourably, indicating a drop in demand.

1(a) Discuss various determinants of demand and bring out difference between normal commodity and inferior commodity.

2018 E (Ques 7)

2(a) What is meant by demand? Also discuss the various determinants of consumers' demand.

2018 E (Ques 8)

1(a) Define consumer demand and discuss the factors upon which demand depends.

2018 S

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Demand refers to the quantity of a commodity which a consumer is able and willing to buy at a particular price within a given period.

### FACTORS/DETERMINANTS AFFECTING DEMAND:

#### ① Price of Commodity itself

Demand is inversely proportional to price of commodity  
so Dem.  $\uparrow \rightarrow$  price  $\downarrow$  and otherwise

#### ② Price of Related Goods

[b] Complimentary Goods Vs. Substitute Goods.  
2020 M

If price of substitute good  $\uparrow$ , demand of good  $\uparrow$  ( $P_a \uparrow \Rightarrow P_b \uparrow$ )

No there's direct reln (Ex) coca-cola, pepsi

If price of complementary good  $\uparrow$ , \_\_\_\_\_  $\downarrow$  ( $P_a \uparrow \Rightarrow P_b \downarrow$ )

No indirect reln (Ex) (car, petrol), (TV, ~~petrol~~)

#### ③ INCOME OF CONSUMER

##### a) Normal Good (Utility good)

direct reln (Ex) Full cream milk, basmati rice

##### b) Inferior good

indirect reln (Ex) toned milk, parboil rice.

#### ④ TASTE AND PREFERENCE

If consumer has special taste then demand of that product  $\uparrow$

(Ex) tata salt, tata tea.

#### ⑤ WEATHER AND CLIMATE

#### ⑥ Future expectation of:

price rise  $\Rightarrow$  dem. rise in present

price fall  $\uparrow$  dem. fall

I a What do you mean by Price Elasticity of Demand? How it can be used in decision making. 2+3 = 5

Q2. Discuss the significance of price elasticity of demand. 2019 M 5

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The significance of price elasticity of demand can be understood by the following:

① To A MONOPOLIST

He considers nature of demand while fixing price of his product

If demand for product is elastic  $\Rightarrow$  fix low price

If demand " inelastic  $\Rightarrow$  " high "

② To A FINANCE MINISTER / Govt Policy FORMULATION

It is imp for formulation of taxation policy.

Govt impose heavy tax on inelastic demand goods to increase revenue E.g.) Liquor, tobacco

Govt impose low tax from product with elastic Ed so that revenue doesn't fall if demand ↓ on inc tax.

③ USEFUL IN PRICE FARMING

It helps in determining price to be paid to factors of production.

Share of each factor in the national product is determined in proportion to its demand in productive activity. If demand for a particular factor is elastic as compared to the other factors then it will attract more rewards.

④ USEFUL IN INTERNATIONAL TRADE

Its useful in order to fix prices of the goods to be exported.

A country may fix price high for products with inelastic demand. However, if demand in the importing country is elastic then the exporting country will have to fix low prices.

⑤ PARADOX OF POVERTY

A bumper crop, instead of prosperity brings poverty as due to inelastic demand of crops when supply ↑, their price falls and total income goes down.

Eg) farmer throw tomato on road

5. You are CEO of a company. Price Elasticity of demand for your product is more than unit. What type of the product may be? Also discuss pricing policies for it.

[5][CO#3]

2023M

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Product with price elasticity more than 1 is called elastic product.

Product with price elasticity less than 1 is called inelastic product.

Product with price elasticity equal to 1 is called unit elastic product.

Product with price elasticity more than unit is called elastic product.

Product with price elasticity less than unit is called inelastic product.

Product with price elasticity equal to unit is called unit elastic product.

Product with price elasticity more than unit is called elastic product.

Product with price elasticity less than unit is called inelastic product.

(ii) The market supply and demand function for deluxe pizzas in a small town are given by

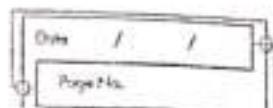
$$\text{Demand } Q = 100 - 3.5p$$

$$\text{Supply } Q = 15 + 1.5p$$

2011 E

(i) Determine the equilibrium price and quantity

(ii) If the city government levies a tax of Rs. 30.00/pizza on the pizza parlor, determine the new equilibrium price and quantity of pizza.



i) for equilibrium,

$$Q_D = Q_S \Rightarrow 100 - 3.5p = 15 + 1.5p \Rightarrow 85 = 5p \\ \Rightarrow p = 17$$

$$\text{and } Q = 100 - 3.5(17) = 40.5$$

$\therefore$  equilibrium price = ₹17

equilibrium quantity = 40.5 units.

ii) after a tax of ₹ 30/pizza is introduced,

$$Q_D = 100 - (3.5)(p)$$

$$Q_S = 15 + 1.5(p - 30)$$

for eq,  $Q_D = Q_S$

$$100 - 3.5p = 15 + 1.5p - 45 \Rightarrow 130 = 5p \Rightarrow p = 26$$

and

$$Q_D = 100 - 3.5(26) = 9 \Rightarrow Q_D = 9$$

$\therefore$  new eq price = ₹26

new eq quantity = 9 units.

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2. What is income elasticity of demand? 2001M

2

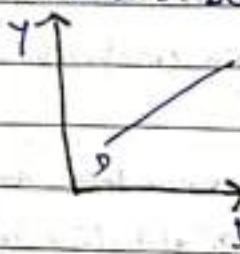
Income Elasticity of demand is the degree of responsiveness of demand to change in income of consumer.

$$E_y = \frac{\% \text{ change in demand}}{\% \text{ change in income}} = \frac{\Delta q/q \times 100}{\Delta y/y \times 100} = \frac{\Delta q}{\Delta y} \times \frac{y}{q}$$

types

i) POSITIVE

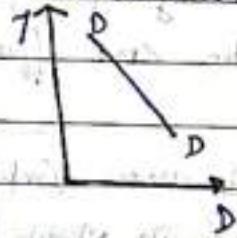
income &amp; Demand



Eg) Good quality goods

ii) NEGATIVE

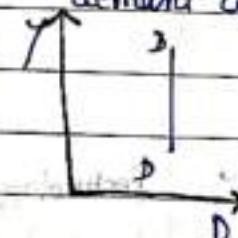
income &amp; (1/Demand)



Eg) inferior goods

iii) ZERO

Demand constant



Eg) essential goods

- ii. The demand x as a function of income y is given by

30x = 10 + 2y. Obtain the expression for the income elasticity of demand and its value when y = 250.

2019S

$$30x = 10 + 2y \Rightarrow x = \frac{1}{3} + \frac{1}{15}y \Rightarrow dx/dy = \frac{1}{15}$$

and

$$\text{at } y = 250, x = \frac{1}{3} + \frac{250}{15} = \frac{51}{3}$$

$$\therefore E_y = \frac{y}{x} \frac{dx}{dy} = \frac{250}{51} \times \frac{1}{15} \Rightarrow Ed = \frac{50}{51}$$

3. What are economic goods? 2001M

2

Economic goods are goods that have exchange value and are less in supply than the demand. They can be exchanged between individuals based on their demand and supply.

These goods include tangible items like machines and raw materials, as well as intangible goods like skills.

Economic goods are scarce resources that have alternative uses and can be used to satisfy the unlimited needs of individuals.

- 1.a Discuss Production Function and its relevance for Engineers in the globalised economic environment. 5

2016E

In a globalized economic environment, the production function is relevant in following ways:

- Efficiency: They can analyse multi input (labour, capital, tech) and o/b to identify optimal combn to minimize cost and maximize productivity.
- Cost-Effectiveness: Consider cost implications and reducing it w/o compromising quality in a glob. market where firms have to be cost effective to remain competitive.
- Technology Adoption: assess impact of adopting new tech and determine if it's viable to adopt in a globalized context.
- Decision Making: Identifying bottlenecks and improving process for competitiveness.

5. What do you mean by Production Function in Economics? 2017M<sub>(3)</sub>

- (b) What do you mean by Production Function? Explain the likely behaviour of Output when all the inputs are increased in the production process. 2022E [CO:1,2][5 Marks]

Production function is a mathematical relation which gives the relationship between physical input and physical output, at a given input at a particular state of technology.

$$Y = f(L, K \text{ etc})$$

acc to Cobb and Douglas, production function is:

$$Y = b L^a K^{1-a}$$

$Y \rightarrow$  total output

$L \rightarrow$  labour input

$b \rightarrow$  total factor productivity

$a \rightarrow$  production elasticity of labour and capital.

- Q4 (a) Explain the likely behavior of Total product and marginal product when only one input is increased for increasing production while all other inputs are kept constant. 2022M [2.5 Marks]

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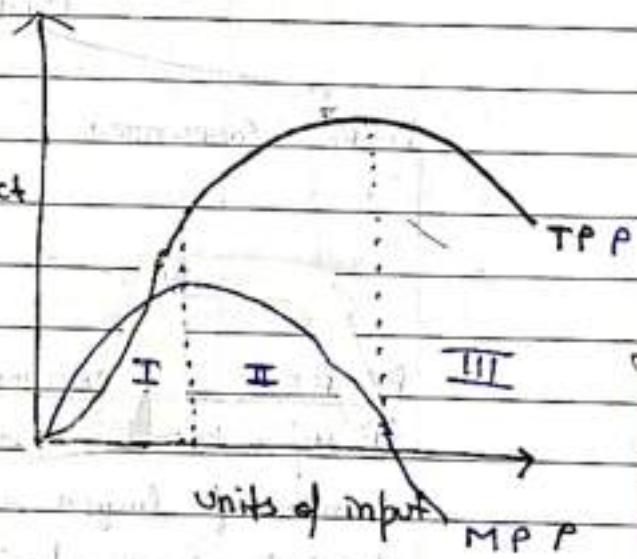
It is explained by law of diminishing marginal product which states that as we increase the production of one input keeping others constant, eventually a point will be obtained after which the marginal product of that input will start to fall.

The total product will increase at an increasing rate, then at decreasing rate and then ultimately decline.

I.) Increasing returns to a factor

MPP  $\uparrow$

TPP  $\uparrow$ , rate  $\uparrow$



II.) Diminishing returns to a factor

MPP  $\downarrow$

TPP  $\uparrow$ , rate  $\downarrow$

III.) Negative returns to a factor

MPP  $\rightarrow -ve$

TPP  $\downarrow$

[b)] Why labour is a unique factor of production? 2012E — (i) Law of variable proportions

3 How labour is a unique factor of production? 2005M : 2

Labor stands out as a distinctive factor of production due to its human nature involving both physical and mental efforts. Unlike others labor is voluntary, driven by people who bring many skills and into the production enabling specialization significantly.

Labor significantly reduces unemployment, income distribution and overall well-being, and investing in human capital enhances the productivity.

Return to Scale: RTS

i) increasing RTS (IRS)

increase in output will be more than increase in input

ii) Constant RTS (CRS)

increase in output will be proportional to increase in input

iii) Diminishing RTS (DRS)

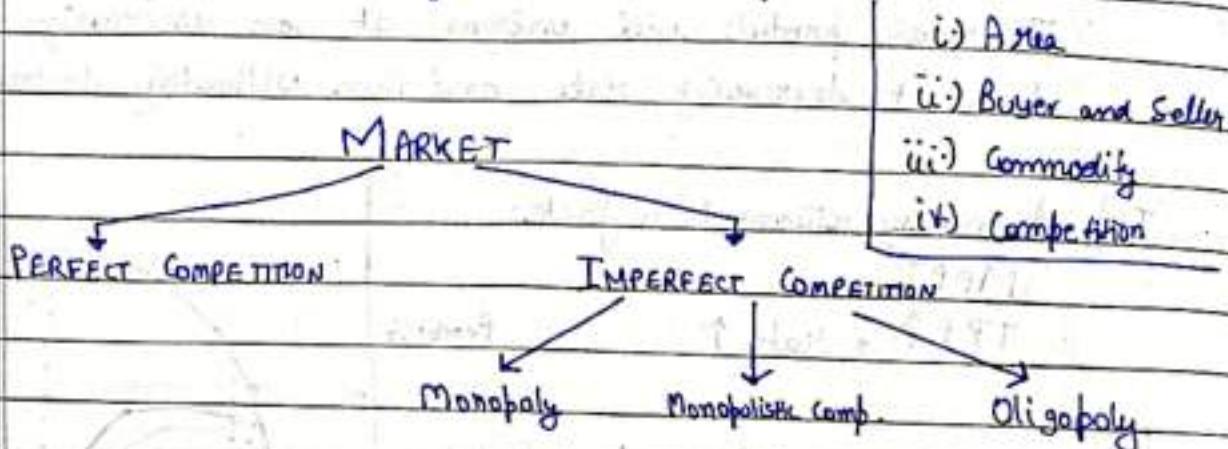
increase in output will be less than increase in input

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- (b) What is the meaning of market in economics and what are various forms of market. 2022 M [2.5 Marks] [CO: 1,2]

Market refers to all such systems or arrangements that bring the buyer and seller in contact with each other to settle the sale and purchase of goods. Its components include:



### PERFECT COMPETITION

It refers to a market situation where there are very large number of buyers and sellers dealing in homogenous (100% identical) product at a price fixed by market.

Eg:) Agricultural goods market.

4. Why Perfect Competition is a hypothetical situation? 2012 M 2

Is Perfect Competitions exist in the real world? Discuss giving suitable examples.

5. Do you think Perfect competition is a real world situation? Discuss. 2019 M

(4)

Perfect competition is considered a hypothetical situation because it requires a set of conditions that are rarely fully met in real world. These are:

- Many Small Firms : but few large players dominate.
- Homogeneous Product : but few products have some degree of differentiation.
- Easy Entry and Exit : but few barriers like capital, regulations, patents exist.
- Perfect information : few consumer and firms don't have perfect info.
- No Market Power : here firms have no control over prices.

4. Is Perfect Competition a real world situation? [5][CO#3]  
Argue your point. 2023 M

- 5 a What do you mean by Monopolistic Competition? How it is different from Monopoly?

2+3=5  
2019S

- 2 Differentiate between following:

- [a] Monopoly and Monopolistic competition. 2005M

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## IMPERFECT COMPETITION

Differentiate between

- a. Monopoly and Monopolistic Competition Market? 2018M (10)

Monopoly (Mono = Single, Poly = firm control)

It is a market in which there is single seller of a product with no close substitutes in market.

Ex) Railways controlled by govt

### Monopolistic Competition

It is a form of market in which there are many buyers and sellers of the product, but the product of each seller is different from that of other. Product differentiation is done through trademark or brand name.

Ex) Lux, Dove, Lizol etc.

It has features of monopoly and perfect competition

### MONOPOLISTIC COMPETITION

- Goods produced are differentiated.
- Large no. of sellers.
- Freedom of entry and exit of new firms.
- Demand curve is more elastic.
- Dominance of selling cost.
- Earn normal profits in long run.

### MONOPOLY

- Goods may or may not be homogeneous.
- Only one seller.
- Restriction on entry of new firms.
- Demand curve is less elastic.
- Selling cost is not necessary.
- Super normal profits in long run.

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## Oligopoly

It is a form of market in which there are few big firms and a large number of buyer of a commodity.

Price and output decision of one firm significantly impacts the price and output decision of the other firms in market.

Thus, there is high degree of interdependence among competing firms and, price and output policy of one firm depends on the price and output of others  $\Rightarrow$  Cut-throat competition.

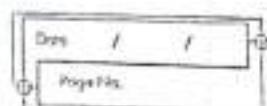
Ex) Telecommunication - Jio, Airtel, Idea, Vodafone

(ii) Monopoly and Perfect competition. 2020M

<u>PERFECT COMPETITION</u>	<u>MONOPOLY</u>
→ Homogeneous Goods	Goods may or may not be homogeneous
→ Large amount of buyers and sellers	Large amount of buyers but only one seller
→ Freedom of entry and exit to the firms	Restriction on entry of new firms.
→ Demand curve is perfect elastic	Demand curve is less elastic.
→ Price taker so prices are comparatively low	Price Mover so prices are comparatively high
→ Equilibrium lvl of o/p is more than $\rightarrow$	Equilibrium lvl of o/p is less than $\leftarrow$
→ Supply curve exists	Supply curve does not exist.
→ Normal profit in long run	Super normal profits in long run
→ Resources are optimally utilized	Resources are not optimally utilized.

3(a) Discuss the nature of computer software market in India. As it is one of highest foreign reserve earner for India, what incentive may be given by the Government to encourage Indian producer? **2018 S**

Discuss the nature of Computer Software market in India. What incentive may be given by the Government to encourage Indian producer? **2013 E**



3(a) Discuss the nature of soft drink market in India. What incentive may be given by the Government to encourage Indian producer? **2018 S**

5

3(a) Discuss the nature of automobile market in India. What incentive may be given by the Government to encourage Indian producer? **2018 S**

3(a) Discuss the nature of automobile market in India. What incentive may be given by the Government to encourage Indian producer? **2019 E**

7

## 1. Computer Software Market in India

### Nature of the Market:

The computer software market in India is characterized by a monopolistic competitive market structure, where a large number of firms operate, each offering differentiated products. This market structure is driven by the continuous innovation and technological advancements in the software industry.

### Incentives for Indian Producers:

Given the significance of the computer software industry as a major foreign exchange earner, the Indian government has implemented various incentives to encourage domestic producers:

- Tax Benefits: The government provides tax breaks and exemptions for software companies, including reduced income tax rates and tax holidays for startups.
- Skill Development Initiatives: The government supports skill development programs and training initiatives to enhance the capabilities of the Indian workforce in the software domain.
- Financial Assistance: The government offers financial assistance, such as grants and subsidies, to promote research and development in the software industry.
- Infrastructure Development: The government invests in creating robust IT infrastructure and promoting digital connectivity to foster a favorable environment for software companies.

## 2. Soft Drink Market in India

### Nature of the Market:

The soft drink market in India is characterized by an oligopolistic market structure, where a few dominant players control a significant share of the market. This market structure is driven by brand recognition, economies of scale, and high advertising expenditures.

### Incentives for Indian Producers:

To promote domestic production and reduce reliance on foreign brands, the Indian government has implemented incentives for Indian soft drink producers:

- Promotional Support: The government provides promotional support to Indian soft drink brands through campaigns and events.
- Regulatory Support: The government facilitates regulatory processes and simplifies licensing requirements for Indian soft drink companies.
- Focus on Local Ingredients: The government encourages the use of locally sourced ingredients in soft drink production to boost the agricultural sector.
- Tax Incentives for Rural Production: The government offers tax incentives to soft drink companies that establish production facilities in rural areas to promote regional development.

## 3. Automobile Market in India

### Nature of the Market:

The automobile market in India is characterized by a monopolistically competitive market structure with a mix of domestic and global players. The market is segmented based on various factors, including vehicle type, price range, and features.

### Incentives for Indian Producers:

To encourage domestic production and enhance India's manufacturing capabilities, the government has implemented incentives for Indian automobile producers:

- Production Linked Incentive (PLI) Scheme: The government introduced the PLI scheme to provide financial support to automobile manufacturers based on incremental sales.
- Research and Development Incentives: The government offers tax incentives and funding support for research and development activities in the automobile sector.
- Focus on Electric Vehicles: The government promotes the adoption of electric vehicles (EVs) by providing subsidies, tax benefits, and charging infrastructure support.
- Skill Development for Auto Industry: The government supports skill development programs to create a skilled workforce for the automobile industry.

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I(a) Discuss factors which an enterprise must focus to sustain in the market? 5.  
Discuss.

201PS

**Ques:** Discuss characteristics of four different forms of market. 2011 E 7

### 1. PERFECT COMPETITION

- Large no. of buyers and sellers
- Homogeneous or identical products.
- Perfect knowledge and info about the market
- No barriers to entry or exit
- Price is determined by market forces of demand and supply
- Firms are price takers, they have no control over price

Eg.) Agriculture markets and stock exchanges.

### 2. MONOPOLISTIC COMPETITION

- Large no. of buyers and sellers
- Differentiated or heterogeneous products
- Limited knowledge about market share of rivals.
- Some control over price due to product differentiation
- Firms compete on the basis of product diff and marketing strategies

Eg.) toothpaste and can industry.

### 3. OLIGOPOLY

- Few large firms dominate the market.
- Interdependence among firms due to action of competitors
- High barriers to entry
- Firms may engage in non-price competition, such as ads and diff

Eg.) automobile and airline industry.

### 4. MONOPOLY

- Single Seller or producer in market.
- No close substitutes for the product.
- High barriers to entry such as patents or resource control
- Monopolist has significant control over price
- Limited competition and potential for earning super-normal profits

Eg) public utilities, Microsoft (in past)

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## (c) Average cost and Marginal cost 2005M

All costs which a firm incurs in course of its production or acquiring a good or service is called total cost. It is known as Acquisition or sunk cost. Ex) cost of production of car.

Average cost is the cost per unit produced.

Marginal cost is the increase in cost as a result of a unit change in output. In other words, the additional costs incurred when there is a unit change in existing amount of goods and services.

## 3 What do you mean by Opportunity cost? 2005M 3 Discuss Opportunity Cost 2012M

Opportunity costs represent the benefits or revenue forgone by pursuing one course of action rather than other. This means when the best alternative is adopted, it is obvious that the second-best alternative cannot be implemented and its benefits are forgone!

Thus, the benefit of the second-best alternative which has been sacrificed due to the selection of the best alt is known as the opportunity cost of the best alternative (its imaginary).

(Q)

6.a Discuss similarity and differences between Oligopoly and Monopolistic Competition.

2016E

5

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### SIMILARITIES

They share the characteristics of imperfect competition, wherein the market control is concentrated among a few entities. Both exert significantly good influence on prices due to limited or no competition. High barriers to entry discourage new competitors in both scenarios, contributing to the dominance of existing players.

### DIFFERENCES

The primary distinction lies in the number of dominant players; monopolies feature a single dominant entity, whereas oligopolies involve a limited group of companies. Additionally, products in a monopoly market are entirely distinct, lacking substitution, while oligopolies may offer similar or differentiated products. These firms often engage in strategic interactions, considering competitor's actions, unlike monopolies that operate without direct rivals.

Ques. Why do businessmen such as automobile dealers tend to locate together?

2016E 7

Businessmen like automobile dealers often locate together due to the benefits of agglomeration. Proximity allows for economies of scale, shared resources, increased customer traffic, and a competitive environment that attracts consumers. This clustering can enhance efficiency, reduce costs and create a more attractive shopping destination for potential buyers.

7. a) Why is firm under perfect competition a price taker and under monopolistic competition is price maker. Explain? 2020S

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### Perfect Competition - PRICE TAKER

In this, firms accepts the price determined by market demand and supply, adopting a dependent price policy due to small market share and hence no control over price. The firm adjusts its production according to prices of market.

### Monopolistic Competition - PRICE MAKER

Here, a single producer with ~100% control over supply can affect the price and supply of product in the market. The firms adopt independent price policy firm can increase or decrease price of its commodity.

5. a) Why do businesses such as automobile dealers tend to locate together?  
Three engineering graduate decides to become automobile dealer, and all three devote their full time to its management. What opportunity cost would you assign to their time? 2013E

The opportunity cost of the engineering graduate's time would be the potential income or benefits they could have earned if they had pursued careers in engineering or related fields instead of becoming automobile dealers.

- b) (i) Three engineering graduates decide open a business, and all three devote their full time to its management. What opportunity cost would you assign to their time? 2011 E 3+4

ii Money Market and Capital Market

2020S

<b>MONEY MARKET</b>		<b>CAPITAL MARKET</b>	
→ It deals with short term funds		Provides capital for medium and long terms	
→ Instruments include promissory notes and bills		Involves stocks, shares and financial assets	
→ Focus on borrowing and lending for short periods		Stock exchanges facilitate buying and selling	
→ Near money (Short-term bills) is prevalent		Old capital market involves existing securities	
→ Key participants: discount houses, bill brokers		→ : stock exchange, investors.	
→ Supports liquidity and short-term financial needs		Aim at raising capital for business expansion.	
→ Funds used for production and exchange dealings		Facilitates investment in established companies -	

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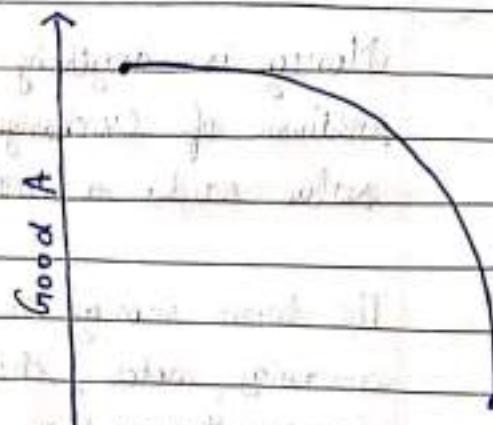
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## e) Production possibility curve

PPC illustrates the trade-off b/w

2 goods/services in an economy.

It shows the maximum combination of goods or services that can be produced given the available resources and tech.



The shape is concave indicating the concept of opportunity cost, i.e. as economy produces more of one good, it must give up increasing amounts of other

Q.4 Which type of raw material and why it should be selected for following?

2023M

- i. Rural House
- ii. National Highway
- iii. Invitation Card for launching of a new model of X brand of car
- iv. Thread which is going to be used by a medical surgeon.

[GPT 3.5]: Bottle of new international brand of perfume.

[S][CO 3]

i. Rural House:

- Raw Material: Timber or locally sourced construction materials
- Why: Timber is often used for rural houses due to its availability, cost-effectiveness, and suitability for traditional construction methods. Local materials can be sustainable and cost-efficient.

ii. National Highway:

- Raw Material: Asphalt or concrete.
- Why: Asphalt and concrete are durable and can withstand heavy traffic loads. They are commonly used for road construction due to their longevity and low maintenance requirements.

iii. Invitation Card for Launching of a New Model of X Brand of Car:

- Raw Material: High-quality paper or cardstock
- Why: High-quality paper or cardstock is chosen for its aesthetic appeal and ability to showcase the brand's image. It provides a professional and luxurious feel.

iv. Thread for a Medical Surgeon:

- Raw Material: Surgical-grade stainless steel or synthetic materials like polypropylene
- Why: Surgical-grade stainless steel is chosen for surgical thread due to its biocompatibility, strength, and resistance to infection. Synthetic materials may be used for specific medical applications.

v. Bottle of New International Brand of Perfume:

- Raw Material: Glass or high-quality plastic
- Why: Glass is often used for premium perfumes due to its elegance and ability to preserve fragrance. High-quality plastic may be chosen for cost-effective options.

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## UNIT-2

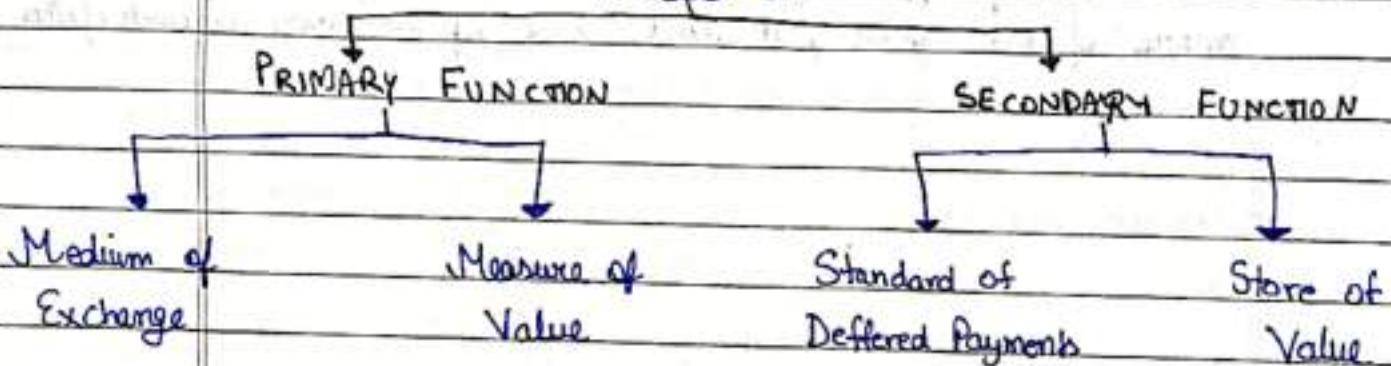
4. What is money? What are main functions of money?

2001M

Money is anything that is generally accepted as a medium of exchange, a measure of value, a store of value and a means for the standard of deferred payment.

The term money is used to cover all such things as coins, currency, notes, cheques etc. which are used to conduct business transactions and settlements of business claims.

### FUNCTIONS



Q) Write function quality and of money?

2012E

#### 1. MEDIUM OF EXCHANGE:

Money, as a medium of exchange means that it can be used to make payments for all transactions of goods and services.

#### 2. MEASURE OF VALUE

It means that money works as a common denominator in which values of all goods and services are expressed.

#### 3. STD. of DEFERRED PAYMENT

acts as standard for payments which are to be made in future.

#### 4. STORE OF VALUE

It can be used to transfer purchasing power from present to future.

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5. Discuss Quality of a Good Money. 2012 M

Qualities of Money are:-

1. Acceptability: people generally accept it for payment settlement.
2. Transferability: it can be transferred from here to there for business easily.
3. Stability: its value should remain constt and not fluctuate day by day.
4. STOREABILITY: its value shouldn't depreciate with time. Paper money.
5. RECOGNIZABLE: holder should const the value of money.
6. MALLEABILITY:
7. DIVISIBILITY: not possible in barter.
8. DURABILITY: dont wear off quickly, long lasting.
9. ECONOMICAL: Low cost of printing and more value.
10. ELASTICITY: Supply can be ↑ or ↓ acc to need.
11. HOMOGENEITY: It should be identical.

✓ Differentiate between following:

[a] Commercial Bank and Central Bank 2012 M

2.2 (a) How are commercial banks different from the Central Bank? 2022 E

3. What do you mean by Central Bank? How it is different from  
Commercial Bank? 2019 S 2+3=5Date: / /  
Page No.:**CENTRAL BANK****COMMERCIAL BANK**

- |   |  |
|---|--|
| → Public welfare is the main objective of the central bank.   | Commercial banks operate to earn profits.                                  |
| → It has no direct dealing with people. They deal directly with the people.                           |  |
| → It is a state owned institution.  | It may be private or state owned.  |
| → They have monopoly of note-issue.   | They can not issue notes.  |
| → Central Bank do not compete with commercial banks.  | Commercial banks compete with each other.                                  |
| → They control the banking system of the country.   | They function under the control of central bank.                           |
| → Central bank is the custodian of foreign exchange of the country.                                   | They depend on the approval of CB in matters of foreign exchange business. |
| → It acts as a banker of the govt. Controls credit and acts as a clearing house for commercial banks. | They may perform this function as representatives of the central bank.     |

Eg) Reserve Bank of India,  
Federal Reserve

Eg) Citi Bank, Bank of New York,  
SBI

3. Why the Central Bank is called Banks' Bank? Discuss. 2019 M (4)

Being the apex bank, the central bank acts as the banker to other banks in three capacities:

P.T.O.

4) Discuss the role of central Bank in liberalised economy. 2020S

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i) It is the custodian of their cash reserves. <sup>of commercial banks</sup>

Banks of the country are required to keep a certain percentage of their deposits with the central bank (known as cash ratio).

ii) As lender of the last resort

The central bank extend loans to commercial banks when all other sources of raising funds are practically closed.

iii) It acts as a bank of central clearance, settlements and transfers. As all commercial banks have their accounts with the central bank, it can easily settle claims of various commercial banks against each other by making debit and credit entries in their accounts.

As a supervisor, the CB regulates and controls the commercial banks by taking care of their licensing, branch expansion etc.

5.a What do you mean by Commercial Bank? How they are different from Central Bank. Discuss mechanism of credit creation by Commercial Banks. 2016E  
Discuss the mechanism of credit creation by commercial banks.

2022E [CO:2][5 Marks]

4[a] Discuss credit creation in Bank. How monetary policy can be used to eradicate unemployment among youth. 2012E 7

Credit creation in a commercial bank is a crucial function where individuals deposit surplus money for safety and profit and the banks in the end generate more money in economy ~~is~~ on paper that it is in reality.

Banks extend loans and charge interest based on this, earning profits.

Refer Box n |||

7(a) What do you mean by Taxation? How it is different from Subsidies? Discuss with suitable example. 2019E

Q.3 What is Tax? Discuss different type of Taxes. [2+3=5] [CO/I and II]  
2023M

2. What do you mean by Tax? How it is different from Subsidy?

2018M (ii)

Taxes are financial levies imposed on an individual or corporation by the government. They are not paid voluntarily and are not 'donations' to government; rather a tax is a compulsory contribution imposed on one failing to pay which will result in legislative punishment.

Q4 Tax and Subsidy. 2012E [a] Tax and Subsidy 2012M

Q5. How tax is different from subsidy? 2019M

6. Differentiate between following

[a] Tax Vs. Subsidy 2001M

(3x2=6)

### TAX

- It is a mandatory payment to the government by individuals or businesses typically based on income, profits or consumption.
- Its purpose is revenue generation.
- It's a financial burden imposed by govt.

Eg) Income tax, Sales Tax, Property Tax, GST

### SUBSIDY

- It is a financial assistance provided by the govt to individual, business or sector to support specific activities or reduce costs or address market failure.

Its purpose is mentioned above.

It's a financial benefit provided by govt.

LPG subsidy, agricultural subsidy.

4. Differentiate between Fee and Tax paid to the government by the citizen of a country 2019M

(4)

b) Differentiate between:  
i) Tax and fees 2020S

### TAX

- Tax is the compulsory payment to the government without getting any direct benefits.
- It's the money govt charges when they perform a specific action or complete a transaction.

### FEE

- Fees are generally obligatory to regulate or control various types of activities. It's applied to particular services.

It's a charge paid to govt which are used to regulate / control various types of activity whose

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- (c) A tax is applied on the income that a person gets during yr.  
 GST  
 income tax  
 gift tax  
 wealth tax

- (c) fees is specifically applied for the use of a service  
 fees to visit bank  
 stamp fee  
 DL fee  
 Exam fee

- (d) Direct taxes and indirect taxes. 2022M [5 Marks] [CO: 3,4]

### DIRECT TAX

- It is the tax levied on person's income and wealth and is paid directly to the govt.
- Evasion is possible and is progressive in nature
- The burden cannot be shifted to another people

### INDIRECT TAX

- It is the tax levied on consumer of goods or services and is paid indirectly to the govt.
- Evasion is not possible and is regressive in nature
- The burden can be shifted to another people.

- Eg) Wealth Tax, Income Tax, Property Tax, Corporate Tax, Import/Export Duty

- Central Sales Tax, VAT, STT

6. Discuss the importance of indirect tax in a developing economy. 2020M

- Revenue Generation:** Sales tax, excise duty etc. contribute to govt's revenue which is used to fund public expenditure on infra dev, education, healthcare etc.
- Economic Stability:** Revenue generated by indirect tax is a stable source of income which is used to manage budget deficits, control inflation and stabilize economy from flux.
- Promoting Domestic Industries:** taxation can be done by promoting domestic industry by putting higher tax on imported goods. This encourage consumers to get local goods.
- Redistributing Wealth:** luxury item  $\Rightarrow$  more tax | essential item  $\Rightarrow$  low tax/no tax. This helps to make a equitable society.
- Encouraging Savings and Investment:**

- a) Is inflation good for economy? How monetary and fiscal policy may be used to control inflation in India?

2020S

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- Q3. What is monetary policy? Explain the tools of monetary policy to control inflation. [5 Marks] [CO: 2, 3]

Monetary policy refers to that policy through which central bank of the country (RBI) controls

a) Supply of money.

b) availability of money.

c) the cost of money or rate of interest

in order to attain a set of objectives focussing on growth and stability of the economy.

Through this the central bank impact credit supply in the economy and check inflation.

### Tools of Monetary Policy:

- Statutory Liquidity Ratio (SLR): The minimum amount (%) of deposits that every commercial bank need to keep for them in form of liquid cash and other assets.
- Cash Reserve Ratio (CRR): The minimum liquid cash (%) of total securities a bank must keep in CRR.
- Repo Rate: It is the rate at which commercial banks take loans from RBI.
- Reverse Repo Rate: RBI take loans from commercial banks for maintains liquidity in market. The interest RBI gives is REPO.
- Open Market Operations: Its the simultaneous purchase and sale of govt security and treasury bills by the RBI.
- Bank Rate (Discount Rate): When a commercial bank lends money from the national bank, the ROI is Bank rate.

5. How monetary policy may be used to eradicate unemployment among youth in India?

2020 M

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If there is large-scale unemployment (such as in this case) in an economy, the govt decides to decrease the rate of interest on bank loan, which leads to larger demand for loan and advances and ultimately eradicate unemployment upto certain extent.

- Q4. What is inflation? Discuss the measures to control inflation

2019 M

4. What do you mean by Inflation? Discuss.

2018 M 6 Discuss Inflation. 2021 M

Inflation refers to the monetary phenomena where prices rise due to an increase in the money supply in circulation, without a corresponding increase in output.

It is a general increase in the price level of goods and services over a period of time.

It is caused by factors such as increased demand of goods and services or increased production costs.

### Types

#### Based on Cause

- ↳ Demand Pull
- ↳ Supply Push

#### Based on Rate of Inflation

- ↳ Creeping
- ↳ Running
- ↳ Galloping
- ↳ Hyper

- [b] What do you mean by Inflation? How it can be controlled?

2018 M

7

- 4(a) What do you mean by Inflation? Discuss fiscal policy and monetary policy to control Inflation. 2019 E

7

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4. Define Inflation. Discuss monetary measures to control inflation.

2010 M

- 1.) Increasing Interest rate can reduce the amount of money in circulation and helps to control inflation.
- 2.) Reducing money supply by selling govt. securities or tightening reserve requirements for commercial banks can reduce the amount of money available for lending and spending which helps to control inflation.
- 3.) Increasing Bank Rate raises cost of borrowings from the central bank. It forces commercial banks to increase lending rates which discourages borrowers from taking loans. It reduces the availability of credit in the economy to control inflation.
- 4.) Increase in Legal Reserve Requirements (CRR, SLR) reduces the amount of effective cash resources of comm. bank and reduces their ~~together~~ credit creation power to control inflation.

- 5(a) What do you mean by Fiscal Policy? How it can be used to control environmental degradation? 2017 E

- 4(a) What do you mean by Inflation? Discuss role of Fiscal policy in control of Inflation 5 2018 S

Fiscal Policy refers to the policy of central government to control the situation of money supply through which inflation can be controlled.

- 5(a) Discuss use of fiscal policies to alleviate income inequality in the economy?

1. **EXPENDITURE POLICY** (Decrease in govt. spending): Govt. should reduce its exp. to the maximum possible extent. More emphasis should be placed to reduce expenditure on defense and unproductive works. Decrease in govt. spending will reduce the level of aggregate demand in the economy and helps to control inflationary pressures in the economy.

2022 E

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2. **REVENUE POLICY** (Increase in taxes) : During inflation, govt. increases the rate of taxes and even imposes new ones. It leads to decrease in the level of aggregate expenditure in the economy and helps to control inflation.
3. **PUBLIC BORROWING** (Increase in borrowings) : During inflation, govt. borrows money from public to withdraw excess money held by them. It helps them to reduce money supply and for the economy and hence reduce inflation.
4. **DEFICIT FINANCING (Decrease)** : i.e. printing of currency increases the supply of money in economy. During inflation, govt. avoids deficit financing ~~to~~ to prevent increase of money supply.

Q2) What do you mean by Inflation? Discuss various type of Inflation with suitable examples. 2023 M [2+3=5] [CO=1 and 2]

#### TYPES

- 1) **DEMAND-PULL INFLATION**: It is caused when there is a pressure of ever rising demand on a stagnant or less rapidly increasing supply.  
Eg) During an economic boom, consumers have more disposable income, leading to surge in demand for cars. If car production cannot keep up, car prices rise due to excess demand.
- 2) **COST-PUSH**  
3) **SUPPLY-PUSH INFLATION**: It is caused due to rise in production costs often due to factors like increased wages, profit margin, etc.  
Eg) If oil prices spike, it increases the cost of food and transport. This increase in cost can lead to higher prices causing inflation.
- 3) **CREEPING INFLATION**: It is caused due to slow price increase.  
Eg) In a stable economy, the general price level rises gradually by 2% p.a. and this mild inflation is considered normal.
- 4) **WALKING INFLATION**: moderate price increases (3-9% walking)  
Eg) 5-10% p.a., it's manageable for most economies.
- 5) **GALLOPING INFLATION**: (> 20% p.a.)  
Eg) It is disastrous and can lead to economic instability and uncertainty.
- 6) **HYPERINFLATION**: It is categorized by extremely high and uncontrollable price increases (usually above 1000% p.a.).  
Eg) Zimbabwe in 2008 under Mugabe's regime led to astronomical inflation, prices doubling every few hours. This resulted in near worthlessness of Zimbabwean dollar.

Ques 1 Discuss Business Cycle. Discuss role of engineer in bringing out the economy 5  
out of recession. 2017E

Ques 2 Discuss Business Cycle. Discuss role of engineer in bringing out the 2016E<sup>5</sup>  
economy out of recession.

Ques 3 Discuss concept of Business Cycle. 2018M

Business cycles are rhythmic fluctuations of an economy i.e. periods of prosperity followed by periods of depression. These cyclical fluctuations move from one industry to another due to their interconnectedness and from one country to another through foreign exchange.

Periods of prosperity contain in themselves seeds of depression. However, waves of prosperity and depression may not always be of the same length and amplitude.

Ques 1 What do you mean by Business Cycle? Discuss the phases of the Business cycle through which the Indian Economy is undergoing at present. 2013E [7]

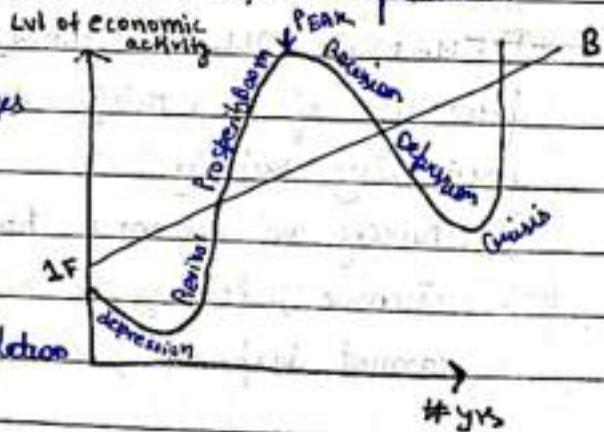
(b) What causes the fluctuations in the Economic output over a period of time. Discuss phases of the business cycle. 2022E [CO:2,3][5 Marks]

Ques 4 What do you mean by Trade Cycle? Discuss. 2017M (5)

Fluctuations can be attributed to various factors like change in aggregate demand, business cycle, supply shocks, monetary and fiscal policy and other external factors.

Ques

Generally, there are four stages of trade cycle. In monetary terminology - the same phases correspond to depression, recession, full employment, inflation and recession.



### i.) DEPRESSION

- Market pessimism leads to persistent demand shortage.
- Management takes cost-cutting measures like waste reduction, efficiency improvements, wage-cuts and lay-offs.
- Reduced wages and job losses affects workers' ability to demand goods and services.
- This lack of demand affect multiple sectors and currency circulation.

Discuss Business cycle. How engineers can help to bring [2.5+2.5=5] the country back to the normal situation? Discuss 2023 E [CO#1and3]

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### (ii) RECOVERY

- 2 a What do you mean by Recession? Suggest how engineers can bring the Indian economy out of recession. 2019S 5

Depression gives place to recovery. Here engineers play a significant role. To create demand, they add value to existing products through technological innovations. Eg) when there was less demand for normal color TV many features were added to enhance its demand.

- optimism replaces pessimism leading to increased demand, production, prices, wages and profits
- higher employment and income stimulate investment, bank activity and currency circulation

### (iii) FULL EMPLOYMENT

- The recovery process continues till full employment is reached
- Wages, interest and profits are high and resources are fully utilized.
- Some voluntary and frictional unemployment may persist.

### (iv) INFLATION

- Excessive investment strains resources, potentially raised cost.
- If resource prices increase, it can disrupt cost calculations and lead to inflation.

### (v) Recession

- over optimism during the boom gives way to pessimism.
- Business expansion halts, orders are cancelled, layoffs occur suddenly.
- widespread unemployment characterizes this painful period.

Recession is a period of general economic decline characterized by a decrease in GDP, employment, investment, spending, and increase in unemployment.

### 2.b National Trade and International Trade 2019M

#### NATIONAL TRADE (Internal)

→ buying and selling of goods within geographical limits of a country. Only one country is involved.

It has less risk involved and payment is made and received in home currency.

No long procedure or formalities have to be completed before starting business.

Rail / Road is used

National rules / laws applicable

Payment by Cash / Cheque

Low operating cost

no effect on foreign revenue of country

Q.5 What do you mean by Dumping in International Trade? Discuss impact of Dumping with suitable examples. [2+3=5][CO# 1 and 3]  
2023M

#### Dumping:

- Reduces the market-share of companies. Eg.) Ford automobile companies reduced the share of domestic companies like TATA.
- It influences the companies to sell products and services at lower rate. Eg.) import of cheap Chinese goods forced domestic sellers to reduce price.
- It increases employment.

#### INTERNATIONAL TRADE

beyond \_\_\_\_\_

→ Maximum 2 countries are involved.

It has high risk involved and payment is made and received in foreign currency.

Long formalities have to be completed before starting business.

Sea / Air is used

International \_\_\_\_\_

payment by bill exchange or banks.

high op cost due to long dist.

direct impact on \_\_\_\_\_

4. What do you mean by Dumping in International Trade? 2018 M (5)

(b) Dumping 2022 M

Q] How you discuss 'Dumping' in context of International Trade?

2012 E

Dumping is the sale of a good abroad at a price lower than the selling price of the same good, at the same time and in the same circumstances at home.

It has 2 categories:

### i) International Dumping.

It means occasional foreign sales below home price or even below the cost of production, with some specific objective such as:

- In a market, prices are temporarily low due to recession.
- To establish a foothold in a foreign market.
- To drive out an existing foreign competition or force it to join a cartel.
- To dispose off occasional domestic surplus.
- To ridise off remnants (left overs) at the end of season.
- To obtain badly needed foreign.

### ii) Persistent Dumping

It means the continuous sale abroad at prices lower than those charged at home. It may be done due to difference in demand curve for a particular commodity in different countries.

(c) Balance of payment and Balance of Trade - 2022 M

### BALANCE OF TRADE :

It refers to the difference between the value of a country's exports and the value of its imports over a specific period of time (usually a year).

If the value of imports exceeds exports, a country has trade deficit.

If the value of exports exceeds imports, a country has trade surplus.

The balance of trade is affected by factors such as exchange rates, tariffs, and the competitiveness of a country's industries.

4. a) What is Balance of payment? Why would it be useful to examine a country's balance of payments data?

2020.5

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## BALANCE OF PAYMENTS

It is a broader concept that includes BOP and also other financial transactions of a country with rest of the world.  
It consists of the :

- current account** : It measures the flow of goods, services and income b/w country and world.
- capital account** : It measures the flow of capital, including investments and loans b/w country and world.
- financial account** : It measures the changes in ownership of financial assets and liabilities.

The BOP provides a comprehensive view of a country's economic ties with rest of the world and helps to assess its overall economic health.

- Q5. Write short notes on any 2 of the following

(a) Free trade and protectionism 2022.4

## FREE TRADE:

Free trade is an economic policy where the entry and exit of foreign firms into the domestic markets of participating countries are unrestricted.

It fosters the exchange of goods and services b/w nations, benefitting all participating firms.

Free trade allows countries to access goods they cannot produce efficiently or cost-effectively domestically.

However, it can negatively affect domestic producers, particularly when cheaper imported goods flood the market. Additionally, it might prioritize short-term gains over long-term interests.

## PROTECTIONISM:

Protectionism is an economic policy aimed at shielding domestic industries from international competition through various restrictions on international trade.

Some common protectionist measures include tariffs or custom duties, quantitative restrictions like quotas, and exchange controls.

It can also involve multiple exchange rates, sanitary regulations, import surcharges and limited purchase regulations.

Arguments in favor of protectionism include support for young and nascent industries, but it can lead to higher prices for consumer and reduce international trade, potentially harming overall economic growth.

Protectionism may also be driven by concerns about wage disparities b/w countries and the desire to equalize production costs.

7. Differentiate between economic growth and economic development.

2020M

### ECONOMIC GROWTH

**Definition** It refers to the increase in the monetary growth of a nation in a particular period.

**SPAN OF CONCEPT**

It is a narrower concept than economic development. Short term.

**SCOPE**

It is a unidimensional approach that deals with the economic growth of a nation.

It is applicable to developed economies.

e.g.) GDP, GNP

### ECONOMIC DEVELOPMENT

It refers to the overall development of the quality of life in a nation which includes economic growth.

It is a broader concept than economic growth. Long term.

It is a multidimensional approach that looks into the income and quality of life in a nation.

It is applicable to developing economies.

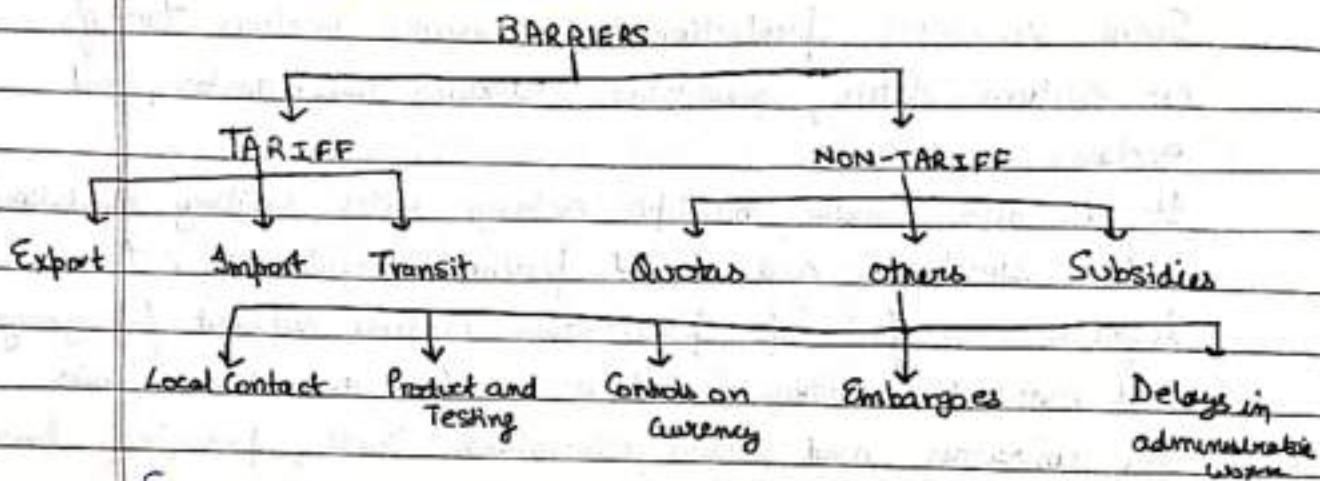
HDI, per capita income, industrial dev.

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- (b) Discuss the major trade barriers imposed by countries to restrict trade.

2022 E [CO:2,3] [5 Marks]

Trade barriers are defined as government induced restrictions on international trade. They are imposed for various reasons, primarily to protect domestic market and to earn revenue.



Some major types of the same are :-

- 1) VOLUNTARY EXPORT RESTRAINTS (VERs): In this type of trade barrier, a nation limits the amount of export and increases the price of the goods and thus the revenue.
- 2) REGULATORY TRADE BARRIERS: These are some legal barriers which hinders the import of the products including product safety & pollution standards.
- 3) ANTI-DUMPING DUTY: In order to tackle dumping, government imposes them to export selling products lower cost to maximize profits.
- 4) SUBSIDY: These are subsidies which act as support provided by govt to the firms manufacturing products to lower production cost and become more competitive.
- 5) TARIFFS: These are taxes on imports imposed to increase price of imported products so that they are not consumed.  $\rightarrow$  ad valorem tax.
- 6) QUOTA: It restricts the quantity of a product that can be imported into a country.

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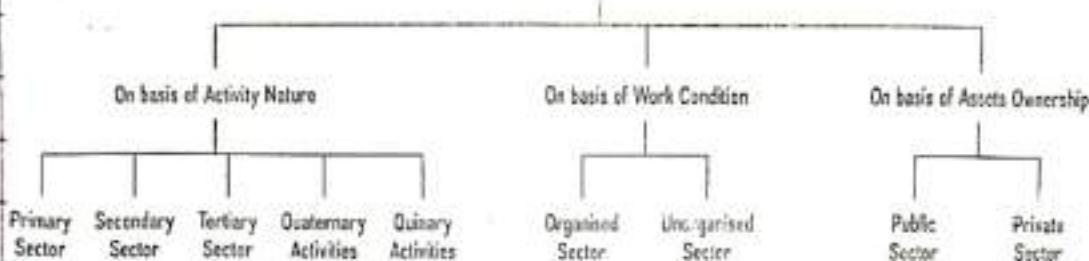
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5. Discuss sectorwise classification of an economy? 2

2001K

The Indian economy is divided into three sectors: primary, secondary, and tertiary.

### India's Economic Sector



- **The primary sector** relies on natural resources for manufacturing and operational processes, with agriculture being a major component. Challenges in this sector include underemployment and disguised employment, which can be addressed through increased government funding for irrigation facilities and support for quality inputs.
- **The secondary sector** is driven by the creation of goods and services, with examples like transportation and manufacturing. This sector employs about 14% of the workforce and contributes around 28% to the GDP. It is considered the backbone of the Indian economy, with prospects for further development.
- **The tertiary sector, or the service sector,** is the largest contributor to the GDP (59%) and employs 23% of the workforce. Examples include IT services and consulting. However, a challenge lies in the lower-salary jobs not attracting sufficient employment, posing a potential obstacle to India's goal of achieving double-digit growth in the future.

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3. Discuss significance of co-operative for a developing country like India. 2020 M

A cooperative is a voluntary organization of any number of persons whose management is based on democratic basis of equality.

Its significant for India and developing countries due to :

- 1) Inclusive Growth: They ensure equitable economic benefits, especially in agriculture, empowering marginal communities.
- 2) Rural Empowerment: Co-operatives in agrarian economies like India provide a collective platform for farmers, fostering rural development.
- 3) Financial Inclusion: By offering banking and credit services, co-operatives bridge gaps in regions with limited banking.
- 4) Employment Generation: Co-operatives create jobs, particularly in rural areas, contributing to local income.
- 5) Social Cohesion: Their democratic structure fosters community development, encouraging active member participation.
- 6) Price Stabilization: Co-operatives stabilize prices by eliminating intermediaries, ensuring fair returns to producers.
- 7) Equitable Profits: Members share profits equally, preventing wealth concentration and reducing exploitation.
- 8) Sustainability: They promote environmentally friendly practices, aligning economic growth with conservation.

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- 7.b The Total Cost (TC) associated with producing and marketing  $x$  units of an item is given by  $TC = .005x^3 - .02x^2 - 30x + 3000$

2016 E

- (i) Total cost when output is 4 units,
- (ii) Average cost of output of 10 units
- (iii) Marginal Cost when output is 3 units
- (iv) The output where  $AC = MC$

i)  $TC(4) = 0.005(4)^3 - 0.02(4)^2 - 30(4) + 3000$   
 $= 0.005(64) - 0.02(16) - 30(4) + 3000 = 0.32 - 0.32 - 120 + 3000$   
 $T.C. = 2800$

ii) Average cost =  $TC/n = TC/x$        $n=10$   
 $AC(10) = 0.005(10)^2 + (-0.02)x - 30 + 3000/x$   
 $= 0.005(100) - 0.2(10) - 30 + 300/10$   
 $A.C. = 270.3$

iii) Marginal cost =  $\frac{dTC}{dx} = 0.015n^2 - 0.04n - 30$        $n=3$   
 $M.C.(3) = 0.015(3)^2 - 0.04(3) - 30$   
 $= 0.135 - 0.12 - 30$   
 $M.C. = -29.985$

iv)  $AC = MC \Rightarrow 0.005n^3 - 0.02n^2 - 30n + 3000 = 0.015n^2 - 0.04n - 30$   
 $\Rightarrow 0.005n^3 - 0.035n^2 - 29.96n + 3030n = 0$   
 $\Rightarrow n =$

- 3 b The total cost function for producing a commodity in  $x$  quantity  
is  $TC = 60 - 12x + 2x^2$ .      1+2+2=5

2019 S

- i. Find the average cost function
- ii. The level of output at which this average cost function is minimum.
- iii. Verify that  $AC = MC$  at the minimum point of AC curve.

i)  $A.C. = T.C./n = 60/n - 12 + 2n$   
 $\therefore A.C. = 2n - 12 + 60/n$

ii) Differentiate AC,  $\frac{dA.C.}{dx} = 2 - 0 - \frac{60}{n^2}$

$\therefore$  for extreme,  $2 - 0 - \frac{60}{n^2} = 0 \Rightarrow n^2 = 30 \Rightarrow n = \pm \sqrt{30}$

$\therefore$  level of output = 5.47 units.

$$\text{iii) } M.C. = \frac{dTC}{dn} = -12 + 4n \Rightarrow M.C. = 4n - 12$$

at  $n = \sqrt{30}$

$$M.C. = 4\sqrt{30} - 12 \quad \text{--- (1)}$$

$$A.C. = 2n - 12 + \frac{60}{n}$$

$$\text{at } n = \sqrt{30} = 2\sqrt{30} - 12 + \frac{60}{\sqrt{30}} = 2\sqrt{30} - 12 + \frac{\sqrt{30} \times \sqrt{30} \times 2}{\sqrt{30}}$$

$$A.C. = 4\sqrt{30} - 12 \quad \text{--- (2)}$$

Thus,  $A.C. = M.C.$  ✓.

Q. A company hardware company purchases computer screen at a cost of Rs. 4500/screen. In case the company makes it, the fixed and variable cost would be Rs. 40,00,000/- and Rs. 2000/ screen respectively. Should the manufacturer make or buy the screen, if the annual demand is of 1500 computers?

2023E

### Case 1: PURCHASE

$$\therefore \text{demand, } q = 1500$$

$$\begin{aligned} \text{total cost} &= P \cdot q = 4500 \times 1500 \\ &= ₹ 6,750,000 \end{aligned}$$

### Case 2: make

$$\begin{aligned} \text{total cost} &= FC + VC \cdot q \\ &= 40,00,000 + 2000 \times 1500 \\ &= ₹ 34,00,000 \end{aligned}$$

Clearly, company should make instead of purchasing.

6.b A firm's total cost function =  $\frac{1}{3}x^3 - 7x^2 + 111x + 50$ ; and  $x = 100 - p$  where 5  
 $p$  is the price and  $x$  is the quantity

2016 E

Date: / /

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 $n = q = \text{quantity}$ 

- (i) Write the total revenue function TR
- (ii) Find profit maximising level of output
- (iii) What is the maximum profit?

$$n = 100 - p \Rightarrow p = 100 - n$$

i)  $T.R. = p \times q$

$$= p \times q = (100 - n) \times n = 100n - n^2$$

ii) profit =  $TR - TC$

$$= 100n - n^2 - (\frac{1}{3}n^3 - 7n^2 + 111n + 50)$$

$$= -\frac{1}{3}n^3 + 6n^2 - 11n - 50$$

differentiate

$$\frac{d\text{pr}}{dn} = -n^2 + 12n - 11$$

for max profit, put  $\frac{d\text{pr}}{dn} = 0$ 

$$\Rightarrow n^2 = 12n - 11$$

$$\Rightarrow n = 11 \text{ or } n = 1$$

double differentiate,

$$\frac{d^2\text{pr}}{dn^2} = -2n + 12$$

$$n = 1$$

$$n = 11$$

$$= 10$$

$$-10 < 0$$

X

$\therefore$  lvl of output for max profit = 11 units

iii) maximum profit =  $-\frac{1}{3}(11)^3 + 6(11)^2 - 11(11) - 50$

$$= \text{₹} 111.33$$

Q.2 (a) A monopolist has the cost function  $TC(y) = 200y + 15y^2$  and faces the demand function given by  $p = 1200 - 10y$ . On the basis of given information, calculate the following: [CO:1,4][5 Marks]

- (i) What output maximizes its profit?
- (ii) What is the profit-maximizing price?
- (iii) What is its maximal profit?

2022 E

i)  $T.R. = p \times y$

$$T.R. = 1200y - 10y^2$$

$$\therefore \text{profit} = TR - TC = 1200y - 10y^2 - 200y - 15y^2$$

$$\text{profit} = -25y^2 + 1000y$$

∴ differentiate,

$$\frac{d\text{profit}}{dy} = -50y + 1000 \Rightarrow y = \frac{1000}{50} = 20 = y$$

iii) profit =  $-25(20)^2 + 1000(20) = 20000 - 400 \times 25 = 20000 - 10000$   
 $= \text{₹} 10000$

ii) price =  $1200 - 10(20) = 1000$

[b] Given the demand function and total cost function of a perfectly competitive firm as:

$$P = 100 - 2n \quad TC = 50 + 2n$$

2018 E(14)

No.

What level of output will maximize total profit and what are the corresponding values of price (P), profit and Total Revenue?

7

$$T.C = 50 + 2n$$

$$T.R = P \cdot n = (100 - 2n)n = 100n - 2n^2$$

$$\therefore \text{profit} = T.R - T.C = 100n - 2n^2 - 50 - 2n$$

$$\text{profit} = -2n^2 + 98n - 50$$

for max

$$\therefore \frac{d(\text{profit})}{dn} = 0 \Rightarrow -4n = -98 \Rightarrow n = 24.5$$

$$\therefore \text{price} = 100 - 49 = 51$$

$$\text{Profit} = -2\left(\frac{49}{2}\right)^2 + \frac{98 \times 49}{2} - 50 = +\frac{49 \times 49}{2} - 50 = 1150.5$$

=

$$TR = 100 \times \frac{49}{2} - \frac{49 \times 49}{2} = \frac{51 \times 49}{2} = 1249.5$$

[a] Given the demand function and total cost function of a perfectly competitive firm as:

$$P = 120 - X \quad 2018 E(14)$$

$$TC = X^3 - X^2 - 10X + 2$$

What level of output will maximize total profit and what are the corresponding values of price (P), profit and Total Revenue?

$$T.R = 120n - n^2$$

$$\therefore \text{profit} = T.R - T.C = 120n - n^2 - n^3 + n^2 + 10n - 2$$

$$\text{Profit} = -n^3 + 130n - 2$$

diff. w.r.t. n

$$\frac{d(\text{profit})}{dn} = 0 \Rightarrow -3n^2 = -130 \Rightarrow n = \pm \sqrt{\frac{130}{3}}$$

$$\therefore n = +\sqrt{\frac{130}{3}} = 6.582$$

$$P = 120 - \sqrt{\frac{130}{3}} = 113.417$$

$$T.R = 120 (\sqrt{\frac{130}{3}}) - \frac{130}{3} = 746.62$$

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- b) Consider a monopolist who faces a linear demand function  $p = 80 - 6q$  and also has a linear total cost function,  $TC = 50 + 20q$ . What will be the equilibrium level of output, price and profit? Also prove the second order condition for profit maximisation.

2020S

$$q = n$$

$$TC = 50 + 20n$$

$$TR = p_n = 80n - 6n^2$$

$$\therefore \text{profit} = TR - TC = 80n - 20n - 6n^2 - 50 \\ = 60n - 6n^2 - 50$$

for max,

$$\frac{d(\text{profit})}{dn} = 0 \Rightarrow 60 - 12n = 0 \Rightarrow n = 5$$

$$\text{price} = 80 - 6 \times 5 \Rightarrow \boxed{\text{price} = 50}$$

$$\text{profit} = 60 \times 5 - 6 \times 25 - 50 = 300 - 150 - 50 \\ \Rightarrow \boxed{\text{profit} = 100}$$

$$\text{total revenue} = 80 \times 5 - 6 \times 25 = 400 - 150 \\ \rightarrow \boxed{T.R. = 250}$$

2nd cond<sup>n</sup> proof

$$\frac{d^2(\text{profit})}{dn^2} = -12 < 0 \rightarrow \underline{\text{maximum profit}}$$

- 5.2 Prepare a cost sheet showing the total cost and per tonne cost of paper manufactured by ABC paper mills Ltd. for the month of March 2023. There are 26 working days in the month. Also find the profit earned by the company. The details are as under:

Direct Material	Paper pulp	6000 tons @ Rs. 900/ton
Direct Labour Cost	Skilled workers	280 @ Rs. 783.00/day
	Semi Skilled	300 @ Rs. 712.00/day
	Unskilled	470 @ Rs. 646.00/day
Direct Expenses	Equipment hire charges	Rs. 12000/day
	Dyes	Rs. 650 per tonne of raw material input

2023 E

Overheads	Variable	@ 50% of Direct Wages
	Fixed	Rs. 270000/month
Administrative overheads		12% of factory or work cost
Selling and Distribution overheads		20% of the prime cost
Profit		10% of the total cost

PARTICULARS	AMOUNT
Raw Material Consumed (6000 x 900)	54,00,000
+ Direct Labour Wages	
Skilled Workers (280 x 783 x 26)	57,00,240
Semi Skilled (300 x 712 x 26)	55,53,600
Unskilled (470 x 646 x 26)	78,94,120
+ Direct Expenses	
Equipment hire charges (12000 x 26)	3,12,000
Dyes (6000 x 650)	39,00,000
PRIME COST	2,87,59,960
+ Factory Overheads	
Variable (1,91,47,960 x 50%)	95,73,980
Fixed	2,70,000
FACTORY OR WORK COST	3,86,03,940
+ Administrative Overheads (3,86,03,940 x 12%)	46,32,473
COST OF PRODUCTION	4,32,36,413
+ Selling and distribution overheads	
overheads (4,32,36,413 x 20%)	57,51,992
TOTAL COST	4,89,88,405
Profit (4,89,88,405 x 10%)	4,89,88,405
SALES	5,38,87,245

(b) A company can make a particular component or purchase from the market. The cost detail is as below:

Prepared by Madhav Gupta (2K21/CO/262)

If it purchases from the market.	Rs.3050+GST @18%
The purchasing price per unit	
If it makes:	
Cost of the machine	Rs 1020300+GST @18%

Salary of the machine operator per month	Rs 30000
Rent of the workshop per month	Rs 25000
Raw material-1 per unit	Rs 400+GST @18%
Raw material -2 per unit	Rs 1100+GST @18%
Other cost per unit	Rs 300

If the annual demand is 1500

2022 E

Whether company should 'Make' or 'purchase'. Suggest:  
[CO:2.4] [5 Marks]

### PURCHASE

$$\text{CTC for 1 product component} = 3050 + \frac{18}{100} \times 3050 = 3599$$

$$\text{CTC for 1500 components annually} = 53,98,500 \quad \text{①}$$

### MAKE

$$\text{Cost of machine} = 10,20,300 + \frac{18}{100} \times 1020300 = 12,03,954$$

$$\text{Salary of operator} = 30,000 \times 12 = 3,60,000$$

$$\text{Rent of workshop} = 25,000 \times 12 = 300,000$$

$$\text{Cost of raw material per unit} = 1500 + \frac{1500 \times 18}{100} = 1770$$

$$\text{Cost of raw material per 1500 units} = 2,655,000$$

$$\therefore \text{CTC for make} = 45,18,954 \quad \text{②}$$

∴

Clearly from ① and ②, making the product gives them an economic advantage of ₹ 8,79,546

They Should MAKE

1. Differentiate between Monetary Policies and Fiscal Policies.

2023R

[5][CO2]

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Monetary Policy

→ It controls the flow of money supply or credit in an economy

→ It is pursued by the central bank of a country

→ Its instruments are bank rate, repo rate, reverse repo-rate, CRR, SLR etc.

Fiscal Policy

It deals with public expenditure and public revenue.

It is pursued by the government.

Its instruments are government expenditure, taxes and public debt.

Date: / /

- Q. What is the significance of studying Engineering Economics for engineering students? How it can be made more relevant. 2013 E

- [a] Why Engineering students should study Economics? 2012E 7

Engineering students should study economics for several reasons:

- 1) Efficiency: Engineering deals with achieving more output with the same input or same output with less input which is a concern of economics too.
- 2) Decision-Making: Engineers (or economists) face choices and decisions in their professional life making understanding economic principles valuable.
- 3) Economy: All engineering activities occur within an economic environment, and engineers must be familiar with it to work efficiently.
- 4) Notable engineers like Arthur M. Wellington and Herbert Hoover emphasized the role of economic analysis in engineering projects.
- 5) Global Market: In today's globalized and competitive markets, engineers need to understand economic theories to make cost-effective technology choices and maximize profits.
- 6.) An engineer's career can be significantly impacted by their ability to deal with economic aspects, especially in a developing country with unique economic characteristics like India.  
 ∴ Sensitizing even 1% of engineering students towards these crucial areas, can have an overwhelming impact.

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1.  Discuss role of appropriate technology in the development of a developing economy. 2013 E

Its role is vital since appropriate technology enhances efficiency, productivity and economic growth.

Developing countries often relies on imported technology, and adaptation is crucial. Eco friendly technologies and addressing environmental concerns are challenges. Tech can raise workforce skills and living conditions, breaking the cycle of poverty.

Information and Communication Tech (ICT) enables global participation in the production process, with countries like India playing a significant role.

- 5 How engineering and technology can be used to improve life in a slum. 2012 E

5(a) Discuss application of Engineering & Technology to improve life at slum. 2018 S

6(a) Discuss application of Engineering & Technology to Improve life at slum. 2018 S 5 (PROJECT BASED)

Engineering and Technology can be used to improve life in slum in many ways, such as improving infrastructure, housing, education and healthcare, and promote economic development.

Some specific examples include rainwater harvesting systems, solar-powered lighting systems, sustainable sanitation systems, low cost building materials, and mobile health clinics.

When evaluating engineering and technology solutions for slums, it is important to consider the cost-benefit and the needs and preferences of the community.

- 7(a) Discuss application of Engineering & Technology to improve life at slum. 2018 E

i(a) Discuss application of Engineering & Technology to improve life at slum. 7 2019 E

- 3(a)  How emerging areas of your branch of engineering may be applied in a slum to improve its condition and life? Discuss. 2019 E 10

Q. 1. Write five salient features of the Indian economy. 2023 E [5][CO# 1]

7(b) Discuss salient feature of the Indian Economy 2018E

3.a Discuss five salient features of the India economy. 2016E

5

7(a) Give eight salient features of Indian Economy. 2011E

7

[b] Explain the salient features of Indian economy. 2019S

7.b Discuss seven salient features of the Indian Economy.

2013E

7

The Indian economy's trajectory from developing to potential superpower status was marked by periods of robust growth, substantial forex reserves and resilience in the face of global financial crises. Its salient features are:

### 1.) LARGE POPULATION PRESSURE

- India has the largest population globally, with a growing population density due to smaller land areas.
- The population has been steadily increasing, driven by a decline in death rates and persistently high birth rates.

### 2.) HIGH DEPENDENCE ON AGRICULTURE

- While the contribution of agriculture to India's GDP has declined, it remains a crucial sector with nearly half of the workforce engaged in agriculture.
- Agriculture not only supports livelihood but also plays a vital role in food security and poverty reduction.

### 3.) EDUCATION

- India has made significant strides in education with a vast network of public funded educational institutions.
- The country has achieved high gross enrollment rates in primary education, and its education system has produced a large pool of English-speaking professionals.

### 4.) HEALTH

- India's healthcare expenditure, as a percentage of GDP, is comparable to other developing countries but lags behind developed nations.

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→ Access to improved water sources and sanitation facilities has improved, but the quality of healthcare services needs attention.

### 5) EMPLOYMENT

- India faces challenges of underemployment and low-quality employment.
- A majority of the workforce is employed in the informal sector, and low female labor force participation is observed.
- The emergence of ICT has introduced new forms of atypical employment.

### 6) ENVIRONMENTAL POLLUTION AND DEGRADATION

- Increasing env. poll is concern due to non-sustainable tech., reckless resource use.
- CO<sub>2</sub> emissions have increased in both developed and developing countries.

### 7) BUSINESS ENVIRONMENT

- Globalization has led to cross-border business operations, with India showing improvements in various indicators for initiating business activities.
- Strong enforcement laws remains a challenge that requires attention.

### 8) SCIENCE AND TECHNOLOGY

- It is vital for economic development, and India has a large pool of scientific and technical professionals.
- India lags behind in research and development compared to China etc.

### 9) Poverty and Malnutrition

- Poverty in India has decreased, but challenges remain in addressing both natural and artificial poverty.

→ Malnutrition, reflected in the high percentage of low birth weight babies, is a persistent issue being tackled through initiatives like National Food Security Act.

#### 10.) STATUS OF INFORMATION AND COMMUNICATION

- India has shown significant growth in ICT.
- However, developed countries use these resources more aggressively for economic development.

#### 11.) INFRASTRUCTURE

- It is essential for economic development, and India has made significant progress since independence.
- Public-Private partnerships are becoming popular, but more private investment is needed to address infrastructure deficits.

5. a) How recent five-year plan of India is different from previous plans? 2020 S

Since 2015, India's five year plans were discontinued and the government shifted to a more holistic and flexible approach with the NITI Aayog's (National Institution for Transforming India) development strategy.

These focus on sustainable development goals rather than rigid five year plans.

- A. a Recently Rs 1000 and Rs.500 notes have been banned in India and not a legal tender any more. Discuss its implication on the Indian economy?

2016/2017 B P.T.O.

5 → irrelevant

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- (b) Discuss the guiding principles of Indian Five Year Plans. [CO:3][5 Marks]

### 2.3.4 Objectives of Planning in India

Main long-term objectives of planning are:

1. Modernisation

It refers to adoption of new technology, new methods of production and changes in social outlook. For example, adoption of high yielding variety of seeds, gender empowerment, etc. Modernisation as an objective implies the use of advanced technology. Advanced technology requires less labour per unit of output. Thus, modernisation creates unemployment.

2. Self-reliance

Self-reliance means reducing dependence on imports of those goods which can be produced within the country itself. Every country wants to achieve self-reliance since dependence on imports for necessary goods invites foreign interference in domestic policies. India wanted to be self-reliant, which means it wants:

(a) Self-sufficiency in foodgrains.

(b) Fall in foreign aid and reduced dependence on imports which is possible when there is growth in domestic production.

(c) Rise in exports.

(d) Rise in contribution of industries in gross domestic product (GDP).

3. Economic Growth

Economic growth is an increase in the aggregate output of goods and services in a country in a given period of time.

Economic growth implies a sustained expansion in economic activities—trade, agriculture, industry, etc—over a long period of time. When an economy attains such a stage of growth, it does not require the assistance of external agencies.

The indicator of economic growth is GDP. GDP is the market value of all goods and services produced in the country in one year. The contribution made by each sector of an economy gives the structural composition of an economy.

4. Equity

Equity refers to reduction in inequality of income or wealth, uplifting weaker sections of the society and a more even distribution of economic power. The socialist pattern of our society aims at raising the standard of living of all people and promoting social justice by reducing inequalities of income and wealth.

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- 4(a) Environmental problems are macro level problems. Discuss the role of appropriate technology in this regard. Also suggest framework to impose taxes to control environmental hazards. **2018 S**

- 5(a) Environmental problems are macro level problems. Discuss the role of appropriate technology in this regard. Also suggest framework to impose taxes to control environmental hazards. **2018 S (2019 G)**

- 5(a) Environmental problems are macro level problems. Discuss the role of appropriate technology in this regard. Also suggest framework to impose taxes to control environmental hazards. **2018 S (2018 G) 5**

**A I**

#### Role of Appropriate Technology in Addressing Macro-Level Environmental Problems

Environmental problems, such as climate change, air and water pollution, and deforestation, are complex and interconnected issues that transcend national boundaries and require a global collective effort to address them. Appropriate technology plays a crucial role in mitigating these environmental challenges and transitioning towards a more sustainable future.

#### Key Benefits of Appropriate Technology in Environmental Management:

- Reduction of Environmental Impact:** Appropriate technologies are designed to minimize their environmental footprint, reducing greenhouse gas emissions, conserving natural resources, and preventing pollution.
- Enhanced Sustainability:** Appropriate technologies promote sustainable practices, ensuring that future generations can meet their needs without compromising the environment.
- Empowerment of Local Communities:** Appropriate technologies often involve local communities in their development and implementation, fostering economic growth and social empowerment.
- Cost-Effectiveness:** Appropriate technologies are often more affordable and adaptable to local conditions, making them suitable for developing countries.

#### Framework for Imposing Taxes to Control Environmental Hazards

Environmental taxes are a powerful economic tool to discourage harmful activities and generate revenue for environmental protection measures. A well-designed tax system can effectively internalize the environmental costs of pollution and resource consumption, incentivizing businesses and individuals to adopt more sustainable practices.

#### Key Principles for Effective Environmental Taxes:

- Polluter Pays Principle:** Taxes should be levied on those who generate pollution or deplete natural resources, reflecting the environmental costs of their actions.
- Tax Incidence:** Taxes should be designed to target the sources of environmental problems, ensuring that the burden falls on those responsible for the damage.
- Revenue Allocation:** Tax revenues should be earmarked for environmental protection efforts, such as pollution abatement, clean energy infrastructure, and sustainable resource management.
- Tax Effectiveness:** Tax rates should be set at a level that discourages harmful activities without unduly burdening businesses or individuals.
- Tax Fairness:** Tax policies should be transparent, consistent, and fair to all sectors and individuals, avoiding undue economic hardship.

3. a) What do you mean by Green revolution and what are the drawbacks of the green revolution in Indian agriculture. 2020S

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Green revolution is a technological package introduced under a strategy for agricultural development implemented for the first time in India in 1966-67 over 4.8 million acres, aimed at securing rapid increase in food production in the shortest possible time through the:

- a) use of high yielding exotic and hybrid varieties of seeds.
- b) use of chemical fertilizers.

#### DRAWBACKS OF GREEN REVOLUTION

1. Excessive use of chemical fertilizers, pesticides result in air, soil, water pollution.
2. More requirement of water HYV crops result in depletion of groundwater resources.
3. Use of agrochemicals was an expensive measure for Indian farmer.
4. A lack of biodiversity in the global structure of croplands has been established, which can be worked out by a single managing culture.
5. This also reduces the soil quality.
6. Increased inequalities between income in wealth as only adopt by rich farmers.

7[a] (i) What sort of pollution problems would you expect in a small African village, In a city in India, In New York City? 202E

In a small African village, marine and air pollution are likely prevalent due to limited waste management infrastructure and environmental regulations.

In a city in India, air pollution is a significant concern due to the population growth, industrial expansion and high vehicle usage.

In NYC, pollution issues include air pollution from industrial activities and transportation, as well as water and soil pollution from various sources, despite efforts to address them.

- (ii) What would you do about smoke emitted by a municipal electricity plant? What information will you need to collect before giving suggestion?

2012 E

7

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To address smoke emitted by a municipal electricity plant, implementing emission taxes are effective. The govt can measure pollution levels through meters, charging polluters based on emitted quantities. This financial penalty encourages "green" with charges ↑ for higher emissions and ↓ with pollution lessening.

- Q) Discuss role of engineering and technology in achieving [5][CO#3] Sustainable Development Goal 2030.

2013 E

DIY

- 1(a) You will suggest 'Labour intensive production process' or 'Capital intensive production process' for a labour surplus country like India. Discuss with suitable example.

2019 E

Developing economies like India which are generally labour surplus and short of capital may adopt labour intensive production process.

Ex) Garment industry is a labour intensive industry in India. It employs a large no. of people, most of whom are low-skilled. This industry uses relatively simple technology, and the production process is largely manual.

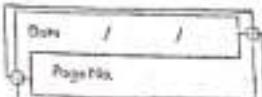
- What do you mean by Labour Intensive and Capital [5][CO#1] Intensive production process? Discuss with example.

2023 E

### CAPITAL INTENSIVE

It relies mostly on machinery, technology and capital investment rather than on human labor. This means that a significant portion of the production is automated or requires advanced setup.

Ex) In silicon chip manufacturing industry, advanced machinery and tech are crucial for intricate and precise processes involved in Chip production.



## LABOUR INTENSIVE

It relies more on human effort and less on capital intensive machinery. In such processes, the workforce plays a more significant role, and the production may involve manual tasks.

Ex) In textile weaving, production of fabrics often involves a substantial amount of manual labour in tasks like spinning and weaving.

- 2(a) What is the rationale for government intervention in the market? In the light of these how would you justify the recent move towards demonetization in the Indian economy? 2018E

**[IRRELEVANT]**

Government intervention in the market is often justified to address market failures and promote efficiency. This can include correcting externalities, ensuring competition, stabilizing the economy, and fostering technological progress.

Interventions such as regulations, taxation and subsidies aim to optimize resource allocation and encourage sustainable economic development within the engineering sector.

- (a) Suggest measures to maintain balance between economic development and environmental protection. 2011G 7

Suggest five measures which can be taken for balancing environmental protection with economic development. 2019S

It can be maintained by the process of sustainable development which aims at raising the quality of life at both present as well as future generations without threatening natural endowments etc.

We know economic development has caused various problems like:

- i) Diverse crops grown on land has led to fall in soil fertility.
- ii) Excessive mining of iron, coal, Au, Ag and extraction of crude oil has led to depletion of their stock.
- iii) Smoke and other injurious emissions from factories and transport has lead to pollution of environment.

Sustainable development includes:

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1.) Sustained use in per capita income:

There should be a sustained use in P.C.I. (real/resource) and economic welfare over time.

2.) Rational Use of Natural Resources:

Contrary to not using natural resources, it simply means that NRs be rationally used in a manner such that they are excessively exploited.

(3) Check on Pollution

It discards those activities which induce environmental pollution which is viewed as an element of social cost.

Financial investment and Real investment

FINANCIAL INVESTMENT

→ Exchange property, ownership and payment to make profit

→ Financial investment affects an exchange of existing money from one person to another, but does not support the creation of new wealth.

Eg) Purchasing a stock from another and then re-selling it to someone else once value rises.

REAL INVESTMENT

Using money to create new capital goods.

Real investment creates net wealth and is more helpful to our economy for its potential to spread that wealth and create wealth making abilities for others.

Purchasing land and developing a farm that will produce crops, employ people and create a non-exploiting profit for the owner of the land / farm.

Q. What do you mean by Fiscal Policy? How companies can be encouraged to opt for green technology through using [CO#1and3] Fiscal Policy. Discuss.

2023 E

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Governments can use fiscal policy to encourage companies to adopt green technologies by :

- Internalizing environmental costs through random pricing .
- Providing financial incentives for green investments .
- Prioritizing green procurement in public spending
- Investment in green infrastructure
- Introducing performance based measures to reward environmental progress
- Removing harmful subsidies .
- Promoting green finance instruments
- Raising public awareness of green technologies
- Collaborating internationally on green standards and regulations

3(a) Discuss effects of liberalization and globalization on the Indian economy which has ultimately benefitted engineers.

2012E

7

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Liberalization and globalization in India have led to a mixed impact on the economy over the past two decades. The share of the private sector has significantly increased, and public-private partnerships have become the norm for developmental activities. India's trade share has almost tripled, but it still remains below 2%, with a notable achievement in the major export of software.

The influx of multinational companies establishing production units in India has created opportunities for engineers, leveraging India's talented workforce at competitive prices. However, small and micro-enterprises face challenges in coping with increased competition. The liberalization policies have facilitated the growth of the capital market, with foreign investment in Indian capital markets experiencing significant growth.

Despite India's sound fundamentals, it couldn't escape the impact of the global financial crisis, leading to changes in the employment scenario. While the software and financial services sectors have seen substantial growth, other industries like gems & jewelry, transport, and automobiles have faced challenges. In summary, liberalization and globalization have transformed the economic landscape, offering opportunities for engineers but also posing challenges for certain sectors.

What do you mean by production process? Discuss changes which have taken place in the era of Information and Communication Technology?

2019 S

- 2[a] Discuss production process. How advent of information and communication technology (ICT) has affected the production process?

2012 E

- 1(a) What do you mean by Production Process? How it has changed in the era of Information and Communication Technology

2019 S

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A production process is a method of using economic input or resources, like labor, capital equipment or land, to provide goods and services to consumers.

Through production process, a set of input is transformed into a set of output. This has significance for engineers.

Through introduction of some technology, engineers are capable of changing the required input mix, less input requirement, or smaller gestation period can make the production process more efficient.

The advent of information and communication technology (ICT) has made production process even more flexible. Through ICT, a part of the production process can be digitally shifted to a far off place where it can be performed in a cost effective way.

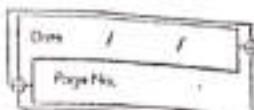
- What do you mean by an Entrepreneur? How it is different from other factors of production? What should be done to enhance entrepreneurship among engineering students?

2017 B

An entrepreneur is an individual who starts their own business based on an idea they have or a product they have created.

It is a vital factor of production, bringing together labor, capital, and land to make goods or services. Unlike other factors, an entrepreneur assumes risk and receives profit in return. To enhance entrepreneurship among engineering students,

fostering a culture of innovation, providing mentorship, and offering practical experience through internships or incubators can be effective strategies. It can also be integrated in education curricula.



Discuss those factors which are crucial for making an innovation successful - business proposition.

2017E

1. **Market Demand:** Successful innovations address a real market need or problem, ensuring there is a demand for the product or service.
2. **Value Proposition:** Clearly articulate the unique value the innovation provides, highlighting its advantages over existing solutions.
3. **Feasibility:** Assess the technical feasibility and practicality of the innovation, considering the required resources, technology, and skills.
4. **Scalability:** A successful innovation should have the potential to scale efficiently to meet growing demand without compromising quality or performance.
5. **Cost-Benefit Analysis:** Conduct a thorough economic analysis to ensure that the benefits derived from the innovation outweigh the associated costs.
6. **Competitive Landscape:** Understand the competitive environment and identify how the innovation differentiates itself from existing and potential competitors.
7. **Regulatory Compliance:** Ensure that the innovation complies with relevant regulations and standards to avoid legal issues and market barriers.
8. **Intellectual Property Protection:** Safeguard the innovation through patents, trademarks, or other forms of intellectual property protection to maintain a competitive advantage.
9. **Adaptability:** The ability to adapt the innovation to evolving market conditions, technological advancements, and customer preferences is crucial for long-term success.
10. **Collaboration and Networking:** Build strategic partnerships, collaborations, and networks to leverage complementary expertise, resources, and market access.
11. **User Feedback:** Gather and incorporate user feedback throughout the development process to enhance the innovation and address user needs effectively.
12. **Effective Marketing and Communication:** Develop a comprehensive marketing strategy to create awareness, generate interest, and communicate the value of the innovation to potential customers.
13. **Talent and Leadership:** Assemble a skilled and dedicated team, led by effective leadership, to drive the innovation from conception to market success.
14. **Sustainability:** Consider the environmental and social impact of the innovation, as sustainability is becoming an increasingly important factor for consumers and investors.
15. **Continuous Improvement:** Foster a culture of continuous improvement, encouraging innovation iterations and updates based on market feedback and changing conditions.

(ii) A person 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. 4,000 at the end of the first year, and therefore he wishes to deposit the amount with an annual increase of Rs. 500 for the next 9 years with an interest rate 15%. Find the total amount at the end of the 10<sup>th</sup> year of the above series.

2011 E

Date : / /

Page No.

5 b A person is planning for his retired life. He has 10 more years of service.

He would like to deposit Rs. 8,500 at the end of first year and thereafter, he wishes to deposit the amount with an annual decrease of Rs. 500 for the next 9 years with an interest rate of 15%. Find the total amount at the end of the 10<sup>th</sup> year of the above series.

2019 S

$$A = A_1 + G \frac{(1+i)^n - 1}{i(1+i)^n - i}$$

$$= A_1 + G (A/G, i, n)$$

Future worth

5 (a) A person is planning for his retired life. He has 10 more years of service. He would like to deposit 20% of his salary which is 4000 at the end of the first year and thereafter he wishes to deposit the amount with an annual increase of Rs 500 for the next 9 years with an interest rate of 15%. Find the total amount at the end of the 10th year of the above series. 2022 E [CO:4][5 Marks]

$$F = A (F/A, i, n)$$

$$= \frac{A(1+i)^n - 1}{i}$$

$$(3) (1) \quad A_1 = 4000 \quad G = 500 \quad i = 15\% \quad n = 10$$

$$\therefore A = A_1 + G (A/G, i, n) = 4000 + 500 (A/G, 15, 10)$$

$$= 4000 + 500 \times \frac{(1+0.15)^{10} - 1}{0.15 (1.15)^{10} - 1} =$$

$$=$$

amount at the end of 10<sup>th</sup> yr = 5961.60.

Now, total amount compounded future worth sum

$$F = A (F/A, i, n) = 5961.60 (F/A, 15, 10)$$

$$=$$

(2) Refer Next Page

[b] A person is planning for his retired life. He has 10 more years of service. He would like to deposit Rs.8300 at the end of the first year and thereafter he wishes to deposit the amount with an annual decrease of Rs.300 for the next 9 years with an interest of 15% Find the total amount at the end of 10<sup>th</sup> year of the above series. 2012 E

A<sub>1</sub> = 8300

G = 300

i = 0.15

n = 10

$$\therefore A = A_1 + G (A/G, i, n) = 8300 + 300 \left[ \frac{(1.15)^{10} - 1}{0.15 (1.15)^{10} - 0.15} \right]$$

$$= 8300 + 300 \times 7.761 = 10628.34708$$

$$F = A (F/A, i, n) = A \frac{(1+i)^n - 1}{i} = 215794.82$$

- 6(b) Consider following cash flow diagram. Calculate the total amount at the end of the 10<sup>th</sup> year if the interest rate of 15%, compounded annually.

- 1.b A person is planning for his retired life. He has 10 more years of service. He would like to deposit Rs. 8500 at the end of first year and thereafter, he wishes to deposit the amount with an annual decrease of Rs. 500 for the next 9 years with an interest rate of 15%. Find the total amount at the end of the 10<sup>th</sup> year of the above series.

2018 E

Date: / /

Page No.:

2016 E

Given,

$$A_1 = 8500$$

$$G_i = -500$$

$$n = 10$$

$$i = 15\%$$

$$(A|G, i, n) = \frac{(i+1)^n - 1}{i(1+i)^n - 1}$$

uniform gradient annual equivalent series

i.e. future worth

$$F = A(F/A, i, n)$$

$$= 6808.40 (F/A, 15\%, 10)$$

$$\text{Ex: amount at the end of every year} = A_1 + G_i (A|G, i, n)$$

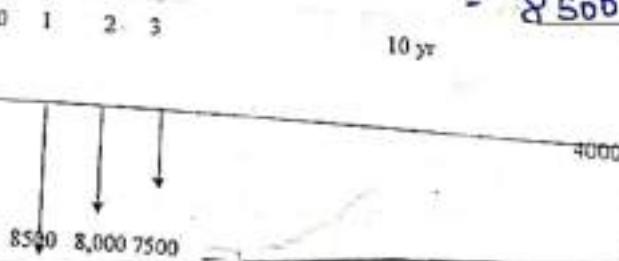
$$= 8500 - 500 \times (A|G, 15, 10)$$

$$= 8500 - 500 \times (3.3832)$$

$$= 6808.40 \times (20.38)$$

$$= 138,237.75$$

Total amount -

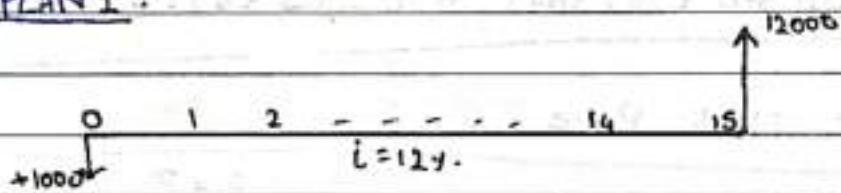


10 yr

$$= ₹ 6808.40$$

- 1.b A finance company advertises two investment plans. In plan 1, the company pays Rs. 12,000 after 15 years for every Rs. 1000 invested now. In plan 2, for every Rs. 1000 invested, the company pays Rs. 4000 at the end of the 10<sup>th</sup> year and Rs. 4000 at the end of 15<sup>th</sup> year. Select the best investment plan for the investor's point of view at the rate of 12% compounded annually. Use present worth method for calculation.

2017 E

PLAN 1 :

$$i = 12\%$$

The present worth of above cash flow is calculated as:-

$$\begin{aligned} PW(12\%) &= -1000 + 12000 (P/F, 12\%, 15) \\ &= -1000 + 12000 (0.1827) \\ &= ₹ 1192.40 \quad - (1) \end{aligned}$$

from (1), (2)

it is clear that

present worth

of plan 1 is

more than that

of plan 2.

Thus, plan 1

is the best

plan from

investor's pov

PLAN 2 :

PW



$$i = 12\%$$

$$\begin{aligned} PW(12\%) &= -1000 + 4000 (P/F, 12\%, 10) + 4000 (P/F, 12\%, 15) \\ &= -1000 + 4000 (0.3220) + 4000 (0.1927) \\ &= ₹ 1018.80 \quad - (2) \end{aligned}$$

b) A person who is now 35 years old is planning for his retired life. He plans to invest an equal sum of Rs. 10,000 at the end of every year for the next 25 years starting from the end of the next year. The bank gives 20% interest rate, compounded annually. Find the maturity value of his account when he will be 60 years old.

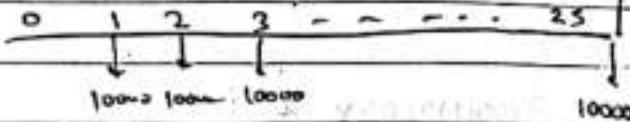
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Page No. \_\_\_\_\_

Given,

$$P = 10000$$

$$n = 25$$

$$i = 20\%$$



$$\therefore F = A(F/A, i, n) = 10000 \left[ \frac{(1+0.2)^{25} - 1}{0.2} \right]$$

$$= 10000 \times 471.981$$

$$= ₹ 47,19,810$$

(b) A person who is 30 years old is planning for retired life. He plans to invest an equal sum of Rs. 15,000 at the end of every year for next 25 years starting from the end of the next year. The bank gives 12% interest rate, compounded annually. Find the maturity value of his account when he is 55 years old.

2018 E/5

The future sum of all annual equal

payments after 25 yrs is equal to ₹ 47,19,810.

$$F = 15000 \left( \frac{(1+12)^{25} - 1}{12} \right) =$$

Q.3 (a) Investment A costs Rs.10,000 today and pays back Rs.11,500 two years from now. Investment B costs Rs.8000 today and pays back Rs.4500 each year for two years. If an interest rate of 5 % is used, which alternative is superior? 2022 E [CO:4] [5Marks]

$$n = 2 \quad i = 5$$

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

$$\text{investment A} = -10000$$

$$\text{payback A} = 11500$$

$$\therefore P(A) = -10000 + 11500 (P/F, 5, 2)$$

$$= 431 \quad -①$$

$$\text{investment B} = -8000$$

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

$$\text{payback B} = 4500$$

$$\therefore P(B) = -8000 + 4500 (P/A, 5, 2)$$

$$= 367 \quad -②$$

from (1), (2) it's clear than investment A is superior alt.

- 5.b A firm, Prime Manufacturing is planning to expand its production operation. It has identified three machines which are technologically capable to serve the purpose. The initial outlay and annual revenues with each of the machines are given below:

	Initial Outlay (Rs.)	Annual revenue	Life (in years)
Machine I	Rs. 5,45,000	Rs. 2,50,000 ✓	15
Machine II	Rs. 6,14,000	Rs. 3,30,000 ✓	12
Machine III	Rs. 6,00,900	Rs. 3,50,000	10

If the rate of interest is 12%, which machine the company should opt for?

Find out the result by Present Worth method. 2016 E | 2016 S | 2018 E

### Technology 1 :

$$\text{initial outlay, } P = \text{₹} 5,45,000$$

$$\text{annual revenue, } A = \text{₹} 2,50,000$$

$$\text{interest rate, } i = 12\%$$

$$\text{life of machine, } n = 15 \text{ yrs}$$

present worth,

$$PW(12\%)_1 = -545000 + 250000 \times (P/A, 12, 15)$$

$$= -545000 + 250000 \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

$$= -545000 + 250000 \times (6.811)$$

$$= \text{₹} 1157750$$

### Technology 2 :

$$P = \text{₹} 614000$$

$$A = \text{₹} 330000$$

$$i = 12\%$$

$$n = 12$$

$$PW(12\%)_2 = 614000 + 330000 \times (P/A, 12, 12)$$

$$= 614000 + 330000 \times 6.194$$

$$= \text{₹} 1430020$$

### Technology 3 :

$$P = \text{₹} 600900$$

$$A = \text{₹} 350000$$

$$i = 12\%$$

$$n = 10$$

$$PW(12\%)_3 = -600900 + 350000 \times (P/A, 12, 10)$$

$$= -600900 + 350000 \times 5.650$$

$$= -\text{₹} 1369500$$

5. A firm, Prime Manufacturing is planning to expand its production operation. It has identified three machines which are technologically capable to serve the purpose. The initial outlay and annual revenues with each of the machines are given below:

	Initial Outlay (Rs.)	Annual revenue	Life (in years)
Machine I	Rs. 5,45,000	Rs. 2,50,000 ✓	15
Machine II	Rs. 6,14,000	Rs. 3,30,000 ✓	12
Machine III	Rs. 6,00,900	Rs. 3,50,000	10

If the rate of interest is 12%, which machine the company should opt for? Find out the result by Annual Equivalence Method. 2018 E | 2017 E | 2018 S

So, second machine will be more effective.

- 4(a) Ms. Kavita deposits her annual bonus into a saving account that pays 8% interest compounded annually. The size of her bonus increases by Rs.5000 each year, and the initial bonus amount is Rs.500. Determine how much will be in the account immediately after the seventh deposit.

2018 E 7

$$A = A_1 + G (A/G, i, n) = 500 + 5000 (A/G, 0.08, 8)$$

$$= 500 + 5000 \times \left[ \frac{(1+0.08)^8 - 1}{0.08(1.08)^8 - 1} \right]$$

$$= 500 + 5000 \times 3.0985$$

$$= \text{Rs } 15992.6197 \leftarrow \text{in acc}$$

- 5(a) A company wants 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.

2018 E 7

here,  $F = 500,000$

$n = 15$

$i = 18\%$

$A = ?$

[b] (i) 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.

2011 E 3

- 5(a) A company wants 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.

2018 S 7

$$\therefore A = F(A/F, i, n) = F \frac{i}{(1+i)^n - 1}$$

$$= 500000 \times \frac{0.18}{(1.18)^{15} - 1} = 500000 \times 0.0164$$

$A = 8200$

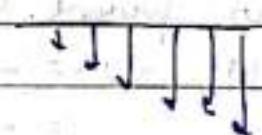
$\therefore$  Annual Equal amount should be  $\text{Rs } 8200$

- Q.7 (a) A company is planning to expand its business after 10 years. To meet the expansion expenditure, at the end of first year the company is planning to deposit Rs. 20,00,000 in the reserve and from the next year it will increase the amount to be deposited Rs. 15,000 from the previous deposit for the next 9 years with an interest rate of 12%. Calculate the total amount which the company will have for the expansion at the end of 10 years.

2022 E [CO:4] [5 Marks]

Uniform gradient series general

Equivalent amount



here,  $A_1 = 2000000$

$G = 15000$

$i = 12\%$

$n = 10$

$\therefore A = A_1 + G (A/G, i, n)$

$$= 2000000 + 15000 \times \left( \frac{(1+i)^n - 1}{i((1+i)^n - 1)} \right)$$

$$= 2000000 + 15000 \times \left( \frac{(1.12)^{10} - 1}{0.12(1.12)^{10} - 0.12} \right)$$

$$= 2000000 + 15000 \times 3.383 =$$

$$= 2050747 \text{ Rs.}$$

- 2(b) A company has to replace a machine in the production line after 11 years at the cost of Rs. 60,00,000/- It plans to deposit an equal amount at the end of every year for the next 11 years at an interest rate of 11 per cent which is compounded annually. Find the equivalent amount that must be deposited at the end of every year for next 11 years.

2018S / 2019 S

- 2(c) A company has to replace a machine in the production line after 11 years at the cost of Rs. 60,00,000/- It plans to deposit an equal amount at the end of every year for the next 11 years at an interest rate of 11 per cent which is compounded annually. Find the equivalent amount that must be deposited at the end of every year for next 11 years.

2023 E / 2018S / 2019 E

- 2(c) A company has to replace a machine in the production line after 11 years at the cost of Rs. 60,00,000/- It plans to deposit an equal amount at the end of every year for the next 11 years at an interest rate of 11 per cent which is compounded annually. Find the equivalent amount that must be deposited at the end of every year for next 11 years.

2018S

$$A = 60,00,000$$

$$n = 11 \text{ yrs}$$

$$i = 11\% \text{ p.a.}$$

$$A = ?$$

$$A = \frac{60,00,000 \times 0.11}{(1.11)^{11} - 1}$$

$$= 60,00,000 \times 0.05112$$

$$= ₹ 3,06,726$$

∴ Ans

Thus, ₹ 3,06,726 must be deposited

- b) ABC Company is planning to expand its production operation. They identified three different technologies for meeting the goal. The initial investment and annual returns with respect to each of the technologies are summarised in table. Suggest the best technology which is to be implemented based on the present worth method of comparison assuming 20% interest rate, compounded annually.

2020S

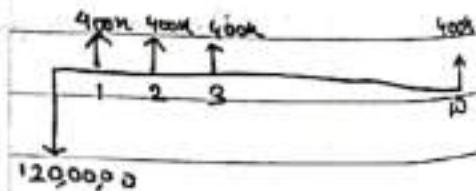
	Initial Outlay	Annual Returns	Life
Tech 1	₹ 12,00,000	₹ 4,00,000	10
Tech 2	₹ 20,00,000	₹ 6,00,000	10
Tech 3	₹ 18,00,000	₹ 5,00,000	10

TECHNOLOGY 1

$$P = ₹ 12,00,000$$

$$A = ₹ 4,00,000$$

$$i = 20\% \text{ p.a.}$$



Thus, present worth expression for Tech 1,

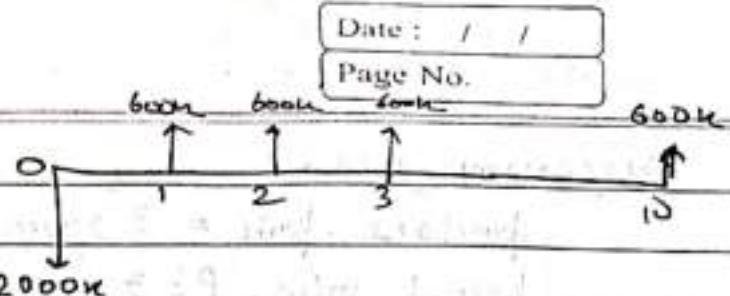
$$\begin{aligned}
 PW_1 (20\%) &= -12,00,000 + 4,00,000 (P/A, 20\%, 10) \\
 &= -12,00,000 + 4,00,000 (4.1725) \\
 &= -12,00,000 + 16,77,000 \\
 &= ₹ 4,77,000
 \end{aligned}$$

TECHNOLOGY 2

$$P = ₹ 20,00,000$$

$$A = 600000$$

$$n = 10 \quad (i = 20\%)$$



$$\begin{aligned} PW_2(20\%) &= -2000000 + 600000 (P/A, 20\%, 10) \\ &= -2000000 + 600000 (0.1925) \\ &= -2000000 + 115500 \\ &= \text{₹} 515500 \end{aligned}$$

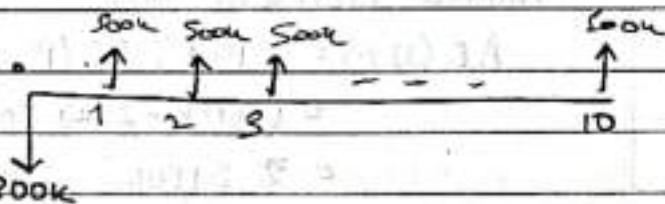
### Technology 3

$$P = 1800000$$

$$A = 500000$$

$$i = 20 \quad | \quad n = 10$$

1800k



$$\begin{aligned} PW_3(20\%) &= -1800000 + 500000 (P/A, 20\%, 10) \\ &= -1800000 + 500000 (0.1925) \\ &= \text{₹} 296250 \end{aligned}$$

Present worth of tech 3 is higher, so tech 3 is suggested for implementation to expand the production.

- b) A company is planning to expand his business after ten years. To meet the expansion expenditure, at the end of first year, the company is planning to deposit Rs. 10,00,000 in the reserve and from the next year it will increase the amount to be deposited by Rs. 10,000 from the previous deposit for the next 9 years with an interest rate of 12%. Calculate the total amount which the company will have for expansion at the end of ten years.

2020S

Given,

$$A_1 = 10,00,000$$

$$G_i = 10000$$

$$i = 12 \quad | \quad t = 10 \quad | \quad A = ? \quad | \quad F = ?$$

$$A = A_1 + G_i (A/G, i, t)$$

$$= 1000000 + 10000 \times 3.5847$$

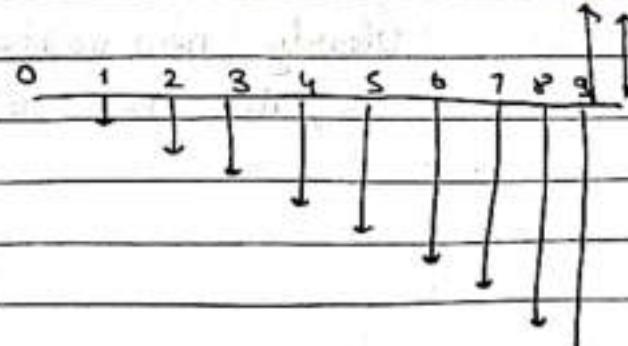
$$= \text{₹} 1035847$$

So, if all installments will be of same amount,  
it will be of ₹ 1035847.

$$F = A \times (F/A, i, t)$$

$$= 1035847 \times 17.539 = \text{₹} 18178079$$

So, the company will get an amount of ₹ 18178079



Prepared by Madhav Gupta (2K21/CO/62)

Two years ago, a machine was purchased at Rs. 2,00,000 to be useful for eight years. Its salvage value at the end of its life is Rs. 25,000. The annual maintenance cost is Rs. 25,000. The market value of the present machine is Rs. 1,20,000. Now, a new machine to cater to the need of the present machine is available at Rs. 1,50,000 to be useful for six years. Its annual maintenance cost is Rs. 14,000. The salvage value of the new machine is Rs. 20,000. Using an interest rate of 12%, find whether it is worth replacing the present machine with the new machine. 2013F

### ALTERNATIVE-1 (Present Machine)

$$\text{Purchase price} = \text{Rs } 2,00,000$$

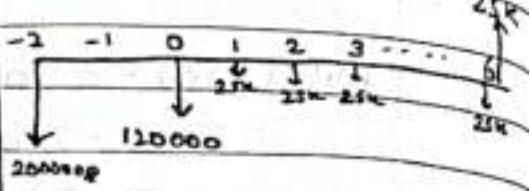
$$\text{Present value}, P = \text{Rs } 1,20,000$$

$$\text{Salvage value}, F = \text{Rs } 25,000$$

$$\text{Annual maintenance cost}, A = \text{Rs } 25,000$$

$$\text{Remaining life} = 6 \text{ yrs}$$

$$\text{Interest rate} = 12\%$$



∴ Annual equivalent cost

$$\begin{aligned} AE(12\%) &= (P-F) (A/P, 12\%, 6) + F \times i + A \\ &= (120k - 25k) (0.2432) + 25k \times 0.12 + 25k \\ &= \text{Rs } 51,104 \end{aligned}$$

### ALTERNATIVE 2 (New machine)

$$\text{Purchase price}, P = \text{Rs } 1,50,000$$

$$F = \text{Rs } 20,000$$

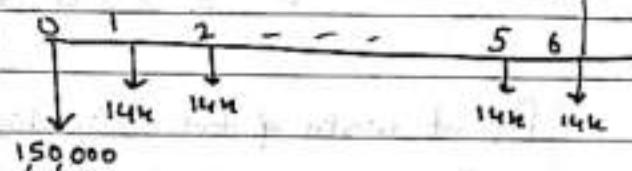
$$A = \text{Rs } 14,000$$

$$\text{Life} = 6 \text{ yrs}$$

$$\text{Interest rate} = 12\%$$

$$(A/P, i, n) = \frac{i(1+i)^n}{(1+i)^n - 1}$$

$$AE(i) = (P-F)(A/P, i, n) + F \times i$$



∴ Annual equivalent cost

$$\begin{aligned} AE(12\%) &= (P-F) (A/P, 12\%, 6) + F \times i + A \\ &= (150k - 20k) (0.2432) + 20k \times 0.12 + 14k \\ &= \text{Rs } 48016 \end{aligned}$$

Clearly new machine gives better annual eq. cost.

So, it's worth replacing the present machine ✓

- 7(b) Two years ago, a machine was purchased at a cost of Rs. 4,00,000 to be useful for ten years. Its salvage value at the end of its life is Rs. 60,000. The annual maintenance cost is Rs. 60,000. The market value of the present machine is Rs. 320,000. Now a new machine to cater to the need of the present machine is available at Rs. 3,80,000 to be useful for eight years. Its annual maintenance cost is Rs. 45,000. The salvage value of the new machine is Rs. 40,000. Using an interest rate of 11%, find whether it is worth replacing the present machine with the new machine?

ALT-1

$$P = 320K$$

$$F = 60K$$

$$A = 60K$$

$$lfe = B = n$$

$$i = 11\%$$

$$\therefore AE(11\%)$$

$$= (320 - 60)K \times (0.1943)$$

$$+ 60K \times 0.11 + 60K$$

$$= ₹ 117123$$

- 7b Two years ago, a machine was purchased at a cost of Rs. 4,00,000 to be useful for ten years. Its salvage value at the end of its life is Rs. 60,000. The annual maintenance cost is Rs. 60,000. The market value of the present machine is Rs. 320,000. Now a new machine to cater to the need of the present machine is available at Rs. 3,80,000 to be useful for eight years. Its annual maintenance cost is Rs. 45,000. The salvage value of the new machine is Rs. 40,000. Using an interest rate of 11%, find whether it is worth replacing the present machine with the new machine?

2018S

2017E / 2019E

- 6.2 Two years ago, a machine was purchased at a cost of Rs. 4,00,000 to be useful for ten years. Its salvage value at the end of its life is Rs. 60,000. The annual maintenance cost is Rs. 60,000. The market value of the present machine is Rs. 320,000. Now a new machine to cater to the need of the present machine is available at Rs. 3,80,000 to be useful for eight years. Its annual maintenance cost is Rs. 45,000. The salvage value of the new machine is Rs. 40,000. Using an interest rate of 11%, find whether it is worth replacing the present machine with the new machine?

2023E

45,000. The salvage value of the new machine is Rs. 40,000/- Using an interest rate of 11%, find whether it is worth replacing the present machine with new machine?

ALT-2

$$P = 380K$$

Annual equivalent Method.

$$F = 40K$$

$$A = 45K$$

$$i = 11$$

$$n = 8$$

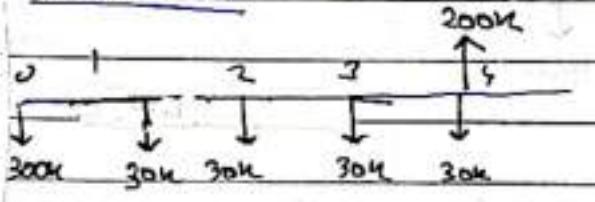
*Clearly, we should replace*

- 6(b) A company must decide whether to buy machine A or Machine B

	Machine A	Machine B
Initial Cost (Rs.)	3,00,000	6,00,000
Useful Life (years)	4	4
Salvage value at the end of machine life (Rs.)	2,00,000	3,00,000
Annual Maintenance (Rs.)	30,000	0

At 12% Interest rate, which Machine should be purchased? Use Present Worth Method.

### 5 Machine A



$$\rightarrow \therefore PW(\text{initial cost}) = -300000$$

$$\rightarrow PW(\text{operating cost}) = -30000 \left[ \frac{(1+i)^n - 1}{(1+i)^n} \right] = -30K (3.0373)$$

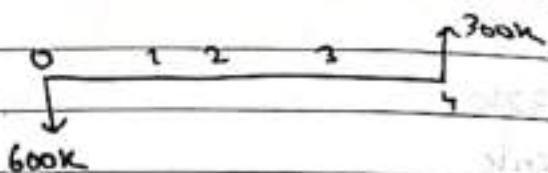
$$= -9120$$

$$\rightarrow PW(\text{salvage value}) = \frac{200000}{(1+i)^n} = 127103$$

$$\therefore \text{Net present value} = \text{sum} = -₹ 264016$$

Date: / /

Page No.

Machine B

$$PW (\text{Initial cost}) = -600k$$

$$PW (\text{Salvage val}) = \frac{300k}{(1+i)^n} = \frac{300k}{(1.12)^4} = 190.655$$

$$\text{Net PW} = -409.344$$

Clearly Machine 1 is better.

MACHINE-A

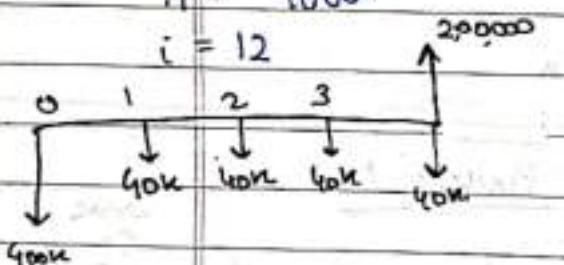
$$P = 400,000 \text{ (initial)}$$

$$n = 4$$

$$\text{Salvage, } S = 200,000$$

$$A = 40,000$$

$$i = 12\%$$



- 7 b A company must decide whether to buy machine A or Machine B.

	Machine A	Machine B
Initial Cost	Rs. 4,00,000	Rs. 8,00,000
Useful Life, in years	4	4
Salvage value at the end of machine life	Rs. 2,00,000	Rs. 5,50,000
Annual maintenance cost	Rs. 40,000	0

At 12% interest rate, which machine should be selected? (Use Future Worth Method of Comparison). 2018S | 2018E

- 7 A company must decide whether to buy machine A or Machine B:

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

At 12 % interest rate, which machine should be selected? (Use Future Worth Method of Comparison) 2017E

$$\begin{aligned}
 FW_A(12\%) &= 400k \times (F/P, 12\%, 4) + 40k \times (F/A, 12\%, 4) - 200k \\
 &= 400k \times 1.574 + 40k \times 4.779 - 200k \\
 &= \text{₹}620,760
 \end{aligned}$$

MACHINE-B

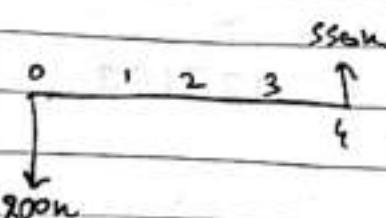
$$P = 300k$$

$$S = 5,50k$$

$$A = 0$$

$$i = 12\%$$

$$n = 4$$



$$\begin{aligned}
 FW_B(12\%) &= 300k \times (F/P, 12\%, 4) - 550k \\
 &= 300k \times 1.574 - 550k \\
 &= \text{₹}709,200
 \end{aligned}$$

Clearly future worth of A is less, so select A.

A company must decide whether to buy Machine A or Machine B by Future Worth method. Rate of interest 12% which is compounded annually.

	Machine A	Machine B
Initial Cost in Rs.	4,00,000	8,00,000
Useful life in years	4	4
Salvage value at the end of machine life in Rs.	2,00,000	5,00,000
Annual maintenance cost in Rs.	40,000	NIL

*similar to prev*

2013 E

- (b) A company must decide whether to buy machine A or machine B:

	Machine A	Machine B
Initial cost (Rs.)	4,00,000	8,00,000
Useful life (years)	5	5
Salvage value at the end of machine life (Rs.)	2,00,000	5,00,000
Annual maintenance cost(Rs)	40,000	0

At 15% interest rate which machine should be selected? Use the future Worth method of comparison.

2013 S

- (b) A company must decide whether to buy machine A or machine B:

	Machine A	Machine B
Initial cost (Rs.)	4,00,000	8,00,000
Useful life (years)	5	5
Salvage value at the end of machine life (Rs.)	2,00,000	5,00,000
Annual maintenance cost(Rs)	40,000	0

At 15% interest rate which machine should be selected? Use the future Worth method of comparison.

2013 E

*So clearly*

*Similar to prev*

FWA (15%)

$$= 400k \times (F/P, 15, 5) \\ + 40k \times (F/A, 15, 5) \\ - 200k$$

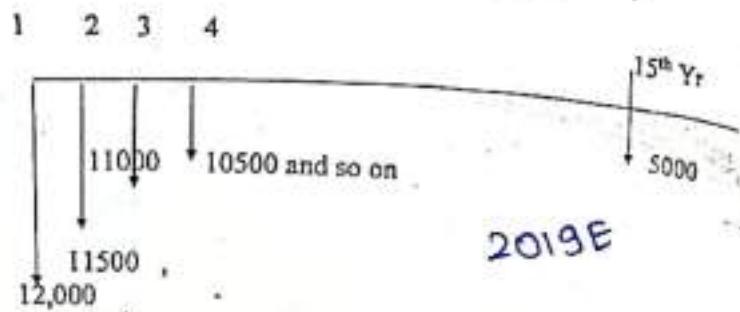
=

FWB (15%)

$$= 800k (F/P, 15, 5) + \\ 1 - 500k$$

=

6(b) Consider following cash flow diagram. Calculate the total amount at the end of the 15<sup>th</sup> year at the interest rate of 11%, compounded annually.



here,

$$A_1 = 12000$$

$$G_1 = -500$$

$$t = 15$$

$$i = 11\%$$

end instiations

$$\therefore A = A_1 - G_1 (A/G, i, t)$$

$$= 12000 - 500 \left[ \frac{(1.11)^{15} - 1}{0.11(1.11)^{15} - 1} \right] = 12000 - 500 \times 5.127$$

$$= \text{₹} 9436$$

$\therefore$  Thus, future total amount

$$\Rightarrow F = A (F/A, i, t) = 9436 \times \left( \frac{(1+0.11)^{15} - 1}{0.11} \right)$$

$$F = \text{₹} 324,658$$

- (b) What is the equal payment series for 10 years that is equivalent to a payment series starting with Rs. 20,000 at the end of the first year and decreasing by Rs. 2,000 each year over 10 years? interest is 8% compounded annually. 2019S 7

$$A_1 = 20000$$

$$G_1 = -2000$$

$$i = 8$$

$$n = 10$$

$$\therefore \text{Annual equal payment} = A_1 - G_1 (A/G, i, n)$$

$$= 20000 - 2000 (A/G, 8, 10)$$

$$= 20000 - 2000 \times \left[ \frac{(1+i)^n - i^n - 1}{(1+i)^n \cdot i - i} \right]$$

$$= 20000 - 2000 \times 3.8713$$

$$= \text{₹} 12257$$

$\therefore$  Equal payment series should have an annual payment of Rs. 12257

- 4(b) A Company wants to deposit money to create an R&D reserve. The company will get 15,00,000 every year for next 15 years for R&D. The reserve will grow at the rate of 12 per cent annually. Find out the single payment which should be made now.

2019S

Date : / /

Page No.

- 4(b) A Company wants to deposit money to create an R&D reserve. The company will get 15,00,000 every year for next 15 years for R&D. The reserve will grow at the rate of 12 per cent annually. Find out the single payment which should be made now.

2018 S

here,

- 4(b) A Company wants to deposit money to create an R&D reserve. The company will get 15,00,000 every year for next 15 years for R&D. The reserve will grow at the rate of 12 per cent annually. Find out the single payment which should be made now.

2018S

$$P = 15,00,000$$

$$t = 15 \text{ yrs}$$

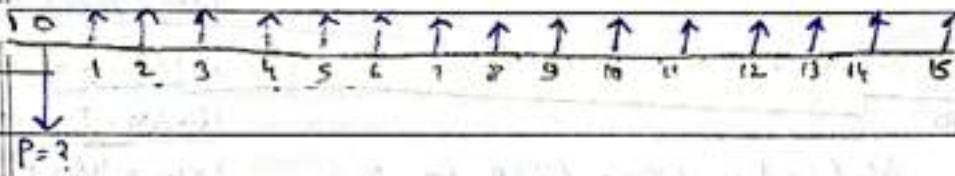
$$i = 12\%$$

$$(P/A, n, i) = \frac{(1+i)^n - 1}{i(1+i)^n}$$

- 4(b) A Company wants to deposit money to create an R&D reserve. The company will get 15,00,000 every year for next 15 years for R&D. The reserve will grow at the rate of 12 per cent annually. Find out the single payment which should be made now.

2019E

2018G



$$P = A (P/A, n, i) = 150,000 \times 6.8109$$

$$= ₹ 102,16,350/-$$

- 2(b) What amount of money saved today will yield Rs. 40,000/- in third year and Rs. 55,000/- after five year at the 12% rate of interest compounded annually.

2019 E / 2018S

$$\text{Given, } F_1 = ₹ 40,000/-$$

$$F_2 = ₹ 55,000/-$$

$$\textcircled{1} t = 3$$

$$i = 12\%$$

$$\textcircled{2} t = 5$$

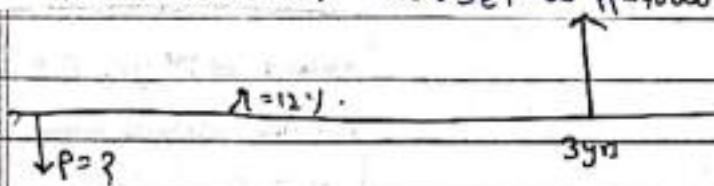
$$i = 12\%$$

- Q) What amount of money saved today will yield Rs. 40,000 [5][CO#2]

in the third year and Rs. 55,000/- after five years at the 12% rate of interest compounded annually.

2023 E / 2019S  $F_1 = 40000$ 

$$F_2 = 55000$$



$$P = F_1 (P/F, i, n) = 40000 (P/F, 12, 3) + 55000 (P/F, 12, 5)$$

$$= 40000 \times 0.7118 + 55000 \times 0.5674$$

$$= ₹ 59,679/-$$

It should deposit ₹ 59,679 today.

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

Brand	Tyre warranty (months)	Price per tyre (Rs.)
A	12	1,200
B	24	1,800
C	36	2,100
D	48	2,700

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? Use Annual Equivalent Method for taking decision.

2016E

In all cases, the interest rate is 12%. This is equivalent to 1% per month.

### BRAND A

tyre warranty = 12 months.

$$\text{price/tyre} = \text{₹ } 1200$$

$\begin{matrix} 0 & 1 & 2 & 3 \\ \downarrow & & & \end{matrix} \quad \dots \quad \begin{matrix} 12 \\ \downarrow \end{matrix}$

$$\therefore \text{annual equivalent, } AE_A(1\%) = 1200 (\text{AIP}, 1\%, 12) \\ = 1200 (0.0828) \\ = \text{₹ } 106.56$$

### BRAND B

tyre warranty = 24 months

$$\text{price/tyre} = \text{₹ } 1800$$

$\begin{matrix} 0 & 1 & 2 & 3 \\ \downarrow & & & \end{matrix} \quad \dots \quad \begin{matrix} 24 \\ \downarrow \end{matrix}$

$$AE_B(1\%) = 1800 (\text{AIP}, 1\%, 24) \\ = 1800 (0.0471) \\ = \text{₹ } 84.78$$

2(b) A transport company has been looking for a new tyre for its truck and has located the following alternatives:

2018E

Brand	Tyre warranty (months)	Price per tyre (in Rs.)
A	12	1,200
B	24	1,800
C	36	2,100
D	48	2,700

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?

### BRAND C

tyre warranty = 36 months

$$\text{price/tyre} = \text{₹ } 2100$$

$$AE_C = 2100 (\text{AIP}, 1\%, 36) \\ = \text{₹ } 69.72$$

### BRAND D

$$TW = 48 \quad P/t = 2700$$

$$AE_D = 2700 (\text{AIP}, 1\%, 48) \\ = \text{₹ } 71.01$$

Here, minimum common life of tyre is considered  $\rightarrow 144$  months.

The annual cost equivalent of brand C is less than that of other brands.

Hence, it should be used in the vehicles of the trucking company.

It should be replaced 4 times during 144-month period.

A small business with an initial outlay of Rs. 12,000 yields Rs. 10,000 during the first year of its operation and the yield increases by Rs. 1,000 from its second year of operation up to its 10th year which is also the last year of operation. The salvage value is zero. Find the present worth of the business by assuming an interest rate of 18%, compounded annually.

2016E / 2017C / 2018S

Given,

$$\text{initial investment, } P = \text{₹ } 12000$$

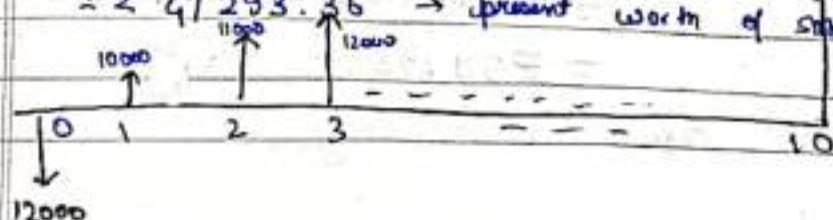
$$\text{income of 1st yr, } A = \text{₹ } 10000$$

$$\text{annual increase income, } G = 1000$$

$$n = 10 \quad i = 18\%$$

Present worth,

$$PW(18\%) = -12000 + (10000 + 1000 (\text{A/G}, 18, 10)) \times (\text{P/A}, 18, 10) \\ = -12000 + (10000 + 1000 \times 3.19336) \times 4.49341 = -12000 + 59293.96 \\ = \text{₹ } 47293.96 \rightarrow \text{present worth of small business}$$



✓ Rs. 40,000 were taken as loan for replacement of a machine and it compounds to Rs. 60,000 in 5 years, what will be the rate of interest which is compounded quarterly.

2013 E

Date : / /

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$$\therefore i = ? \quad | \quad n = 5 \times 4 = 20$$

$$P = 40k \quad | \quad F = 60k$$

$$\therefore P = F \cdot \frac{1}{(1+i)^n} \Rightarrow \frac{4}{6} = \frac{1}{(1+i)^{20}} \Rightarrow (1+i)^{20} = \frac{3}{2}$$

$$\Rightarrow i = \sqrt[20]{\frac{3}{2}} - 1 \Rightarrow i = 1.02 - 1$$

$$\therefore i = 0.02$$

$\therefore$  Rate of interest is 2%.

- 6[a] You want to set up a college saving plan for your daughter. She is currently 10 years old and will go college at the age 18. Assume that when she starts college, she will need at least 100,000 in the bank. How much do you need to save each year in order to have the necessary fund if the current rate of interest is 7%. 2018 E 7

$$\text{Given, } F = 100,000$$

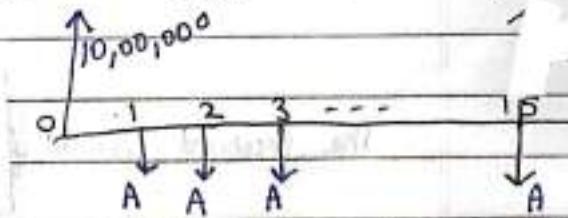
$$A = ? \quad | \quad i = 7\% \quad | \quad n = 8 \text{ (18-10)}$$

$$\therefore \text{Annual cash flow, } A = F \cdot (A/F, 7\%, 8) = 100k \times \frac{(1+i)^n - 1}{i} \\ \Rightarrow A = 100000 \cdot (0.09746) \quad (1+i)^n - 1 \\ A = 9746$$

Thus, I need to save ₹ 9746 every year for the condition.

- 6[a] A Bank gives a loan to a company to purchase an equipment worth Rs. 10,00,000 at an interest rate of 18% compounded annually. This amount should be repaid in 15 yearly equal installments. Find the installment amount that the company has to pay to the bank.

2018 E (CEEE) 7



Equal payment series sinking fund

$$\therefore A = P \cdot (A/P, i, n) = 10,00,000 \cdot (A/P, 18\%, 15)$$

$$= 1000k \times \frac{i}{(1+i)^n - 1} = 1000k \times \frac{0.18}{(1.18)^{15} - 1}$$

$$= 100k \times 0.1964$$

$$= ₹ 196400$$

$$\text{Given, } P = 1000,000$$

$$n = 15$$

$$i = 18\%$$

$$A = ?$$

Thus, annual eq. installments to be paid are ₹ 196400

- (b) The cash flows of two projects proposals are as given below. Each of the projects has an expected life of 10 years. Select the best project based on Present Worth method of comparison using an interest rate of 18% compounded annually.

2018 E (CEEG) (Ans 5)

	Initial outlay(Rs.)	Annual equivalent revenue(Rs.)	Salvage value after 10 years(Rs.)
Project 1	-750,000	2,00,000	50,000
Project 2	-950,000	2,25,000	1,00,000

$i = 18\%$

$n = 10$

Date: / /  
Page No.:Present-Worth MethodPROJECT 1

$PW(\text{initial cost}) = -750k$

$PW(\text{salvage cost}) = 50k \times (P/F, 18\%, 10) = 50k \times (0.1912) = 9560$

$$PW(\text{annual eq. revenue}) = +200000(P/A, 18\%, 10) = 200000 \times \frac{(1+i)^n - 1}{(1+i)^n}$$

$$= 898800$$

$\therefore \text{Total present worth} = -750k + 9560 + 898800 = \text{₹}158360$

PROJECT 2

$PW(\text{initial cost}) = -950000/-$

$PW(\text{salvage}) = 100k \times (P/F, 18\%, 10) = \frac{100k}{(1+i)^n} = 100k \times 0.1912 = 19120/-$

$$PW(\text{annual eq.}) = 225000(P/A, 18\%, 10) = 225k (4.494)$$

$$= 10111.69/-$$

$\therefore \text{Total present worth} = \text{₹}80270$

Thus, best option  
is Project B  
as higher revenue.

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

period	0	1	2	3	4	5
Cash flow (Rs.0)	-1,00,000	30,000	30,000	30,000	30,000	30,000

Given,

$P_1 = -100,000$

$A = 30,000$

$n = 5$

$i = ?$

 $\therefore \text{The present worth for this business is}$ 

$PW(i) = -100000 + 30000 \times \frac{100000}{(1+i)^5}$

$\therefore i = 15 + \frac{566-0}{566+6184} \times 3\% = 15.252\%$

$\text{at } i = 10\%, PW(10\%) = \text{₹}13,724$

$i = 15\%, PW(15\%) = \text{₹}566$

$i = 18\%, PW(18\%) = \text{₹}-6184$

 $\therefore \text{ROI is}$ 

$15.252\%$

An engineer has two bids for an elevator to be installed in a new building. The details

the bids for the elevators are as follows:

Bids	Initial Cost(Rs.)	Service life(years)	Annual operations and maintenance cost(Rs.)
A elevator Inc.	4,500,000	15	27000
B elevator Inc.	5,400,000	15	28500

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

2022/2022E  
2018 n e(c-66)

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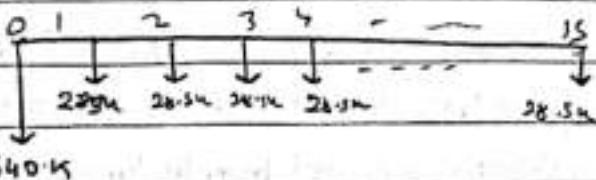
### BETA ELEVATOR

initial cost,  $P = ₹ 540k$

annual cost,  $A = ₹ 22.5k$

life,  $n = 15 \text{ yrs}$

interest,  $i = 15\% \text{ annually}$



The present worth is computed

$$PW_1(15\%) = 540,000 + 22.500(P/A, 15\%, 15)$$

$$= 540,000 + 22.500(5.0474)$$

$$= 540,000 + 113,685.00$$

$$= ₹ 653,685.00$$

since  $PW_1 > PW_2$ , The A elevator is to be accepted, purchased and installed

in new building

- Q) A machine costs a company Rs. 10,000 and its expected life is 5 years. Alternatively, the machine can be obtained by leasing at the annual rent of Rs. 2500. If the rate of interest is 12% per annum, find which alternative is preferable to the company?

2023E

$$\textcircled{1} \quad PW(\text{Machine 1}) = ₹ 10,000$$

$$\textcircled{2} \quad PW(\text{Machine 2}) = 2500 (P/A, 0.12, 5) =$$

$$= 2500 \times \left( \frac{(1+i)^n - 1}{i(1+i)^n} \right) = 2500 \times 3.604$$

$$= ₹ 9011.94$$

Thus, the alternative to obtain machine by leasing is better.

- b) Two possible routes for laying a power line are under study.  
Data on the routes are as follows:

	Unit	Around the lake	Under the Lake
Length		15 Km	5 Km
First Cost	Rs.	1,50,000/Km.	7,50,000/Km.
Useful life	years	15	15
Maintenance cost	Rs.	6,000/Km./yrs	12,000/Km./yr
Salvage Value	Rs.	90,000/Km.	1,50,000/Km.
Yearly power loss	Rs.	15,000/Km.	15,000/Km.

If 15% interest is used, should the power line be routed around the lake or under the lake (use Annual Equivalent Method for analysis).

2019S / 2012E

### ALTERNATIVE 1 - around the lake

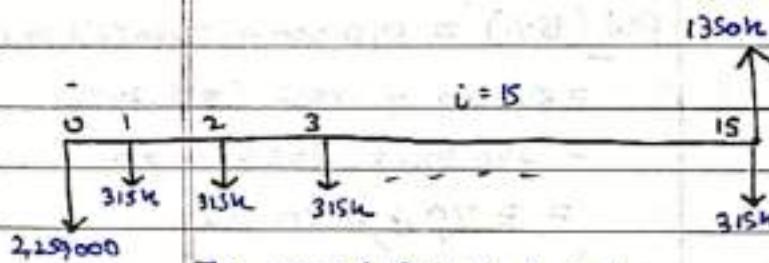
$$\text{first cost} = 150,000 \times 15 = ₹ 2,25,000$$

$$\text{maintenance cost/yr} = 6,000 \times 15 = ₹ 90,000$$

$$\text{power loss/yr} = 15,000 \times 15 = ₹ 225,000$$

$$\begin{aligned} \text{maintenance cost and power loss/yr} &= ₹ 90,000 + ₹ 225,000 \\ &= ₹ 315,000 \end{aligned}$$

$$\text{Salvage value} = 90,000 \times 15 = ₹ 1,35,000$$



The annual equivalent cost,

$$\begin{aligned} AE_1(15\%) &= 225,000 \text{ (AIP, } 15\%, 15) + 315k + 135,000 \text{ (AIF, } 15\%, 15) \\ &= 225,000 (0.1710) + 315k + 135,000 (0.0210) \\ &= ₹ 6,71,400 \end{aligned}$$

- b) A company's management foresees that it will require Rs. 10,00,000 at the end of 10<sup>th</sup> year for modernisation. How much it should deposit now to get the required amount after 10 years. The rate of interest ( $i$ ) is 9%.

2020S

Now,

$$P = F (P/F, 9, 10)$$

$$= 10,00,000 (0.4224)$$

$$P = ₹ 422,400$$

The company should deposit  
₹ 422,400

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### ALTERNATIVE 2 - Under the lake

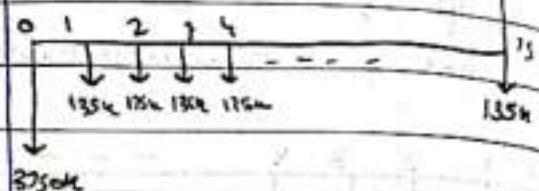
$$\text{first cost} = 7,50,000 \times 15 = ₹ 37,50,000$$

$$\text{maintenance cost/yr} = 12,000 \times 5 = ₹ 60,000$$

$$\text{power loss/yr} = 15,000 \times 5 = ₹ 75,000$$

$$\text{Salvage value} = 150,000 \times 5$$

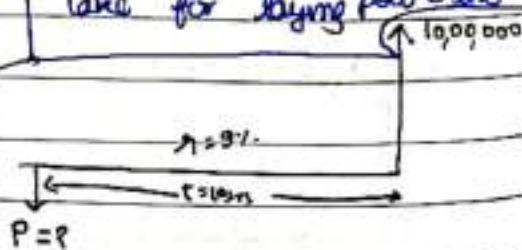
$$= ₹ 2,75,000 \quad 750k$$



The annual equivalent cost,

$$\begin{aligned} AE_2(15\%) &= 375,000 \text{ (AIP, } 15\%, 15) \\ &\quad + 125k - 750k \text{ (AIF, } 15\%) \\ &= 375,000 (0.171) + 125k \\ &\quad - 750k \text{ (0.021)} \\ &= ₹ 7,60,500 \end{aligned}$$

The  $AE_1 < AE_2$ , select  
the route around the  
lake for laying power line



Given,

$$F = ₹ 10,00,000$$

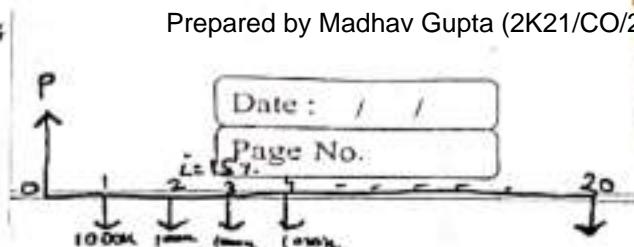
$$t = 10 \text{ yrs}$$

$$i = 9\%$$

$$P = ?$$

- b A company wants to set up a reserve which will help the company to have an annual equivalent amount of Rs. 10,00,000 for the next 20 years towards its employees' welfare measures. The reserve is assumed to grow at the rate of 15% annually. Find the single-payment that must be made now as the reserve amount.

2019 S



Equal payment series present worth amount,

$$P = A \left( P/A, i, n \right) = A \frac{(1+i)^n - 1}{i(1+i)^n}$$

$$= 10,00,000 \left( P/A, 15\%, 20 \right)$$

$$= 10,00,000 (6.2593)$$

$$= ₹ 62,59,300$$

Given,

$$A = ₹ 10,00,000$$

$$i = 15\% \quad | \quad n = 20 \text{ yrs}$$

The amount of reserve which must be set-up now is equal to ₹ 62,59,300.

- 6(a) You borrowed 10,000 from a local bank, with the agreement that you will payback the loan according to graduated payment plan. If your first payment is set at 1500, what would the remaining payment look like at a borrowing rate of 10% over five years.

Given,  $G_1 = ?$

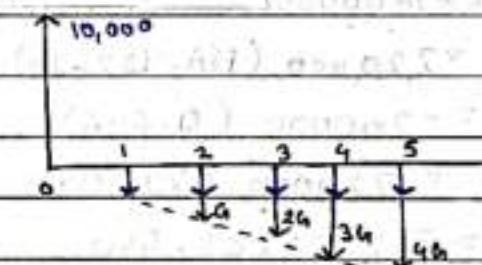
$$A = 1500 \quad n = 5$$

$$P = 10,000$$

$$i = 0.1$$

$$n = 5$$

$$P = 10,000$$



∴ for gradient series.

$$P = A \left( P/A, i, n \right) + G_1 \left( P/G, i, n \right)$$

$$\Rightarrow 10000 = 1.5 \times \left( P/A, 0.1, 5 \right) + G_1 \left( P/G, 0.1, 5 \right)$$

$$\Rightarrow 10000 = 1.5 \times \left[ \frac{(1+0.1)^5 - 1}{0.1(1+0.1)^5} \right] + G_1 \left[ \frac{(1+0.1)^5 - 1}{0.1(1+0.1)^5} - \frac{5}{(1+0.1)^5} \right] \times 1$$

$$\Rightarrow 10000 = 1.5 \times (3.79) + G_1 (6.85)$$

$$\Rightarrow 10000 - 5685 = G_1 \times 6.85$$

$$\Rightarrow G_1 = \frac{4315}{6.85} \Rightarrow G_1 = 629$$

Thus, remaining payment is in gradient of ₹ 629 ps.

- b] A man owns a corner plot. He must decide which of the several alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, he decides that the two best alternatives are as given in the following table: 2012 E

	Build gas station	Build soft ice-cream stand
First cost (Rs)	20,00,000	36,00,000
Annual Property tax (Rs)	80,000	1,50,000
Annual Income (Rs)	8,00,000	9,80,000
Life of building (years)	20	20
salvage value (Rs)	0	0

Evaluate the alternatives based on the future worth method at  $i = 12\%$

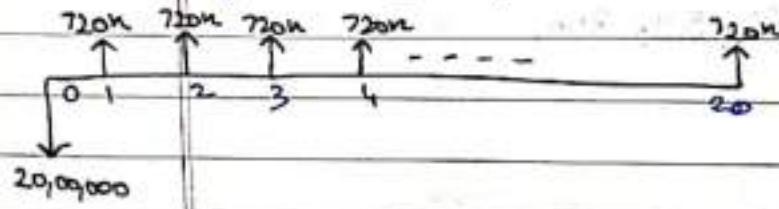
### ALTERNATIVE 1 - Build Gas Station

$$\text{first cost} = ₹ 20,00,000$$

$$\text{net annual income} = \text{Annual Income} - \text{Annual prop. tax}$$

$$= 8,00,000 - 80,000 = ₹ 7,20,000$$

$$\text{life} = 20 \text{ yrs} \quad | \quad i = 12\%, \text{ annual}$$



∴ Future worth of alt 1 is computed,

$$\begin{aligned} FW_1(12\%) &= -20,00,000 (F/P, 12\%, 20) \\ &\quad + 7,20,000 (F/A, 12\%, 20) \\ &= -200000 (9.646) \\ &\quad + 720000 (72.052) \\ &= ₹ 3,25,25,440. \end{aligned}$$

2. Thus, building gas station is the best alternative.

- 5(a) You borrowed Rs. 21,061.82 to finance the educational expenses for your senior year college. The loan will be paid off over five years. The loan carries interest rate of 6% per year and is to be repaid in equal installments over the next five years. Assume that the money was borrowed at the beginning of your senior year and that the first installment will be due a year later. Compute the amount of annual installments.

$$A = P(AIP, 6\%, 5)$$

$$= 21061.82 \times$$

$$= 5000$$

∴ annual installment of ₹ 5,000 is true.

### ALTERNATIVE 2 - Build soft ice cream stand

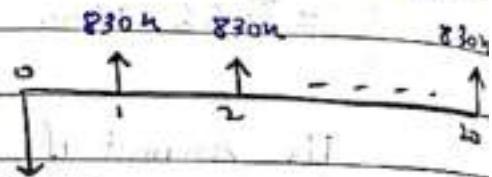
$$\text{first cost} = ₹ 36,00,000$$

$$\text{net annual income} = \text{Annual income} - \text{Annual prop. tax}$$

$$= 9,80,000 - 150,000 = ₹ 830,000$$

$$\text{life} = 20 \text{ yrs}$$

$$i = 12\%, \text{ annual}$$



∴ Future worth of alt 2 is computed

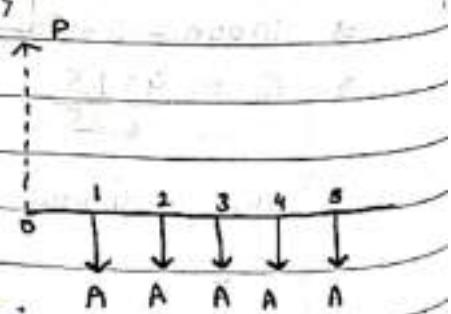
$$\begin{aligned} FW_2(12\%) &= -36,00,000 (F/P, 12\%, 20) \\ &\quad + 830,000 (F/A, 12\%, 20) \\ &= -3600000 (9.646) \\ &\quad + 830000 (72.052) \\ &= ₹ 2,50,77,560 \end{aligned}$$

The future worth of alternative 1 is greater than that of alternative 2.

$$\text{Given, } P = 21061.82$$

$$N = 5$$

$$i = 0.06$$



Q6 (a) A company invests in one of the two mutually exclusive alternatives. The life of both alternatives is estimated to be 5 years with the following investments, annual returns and salvage value.

ALTERNATIVE A

$A = ?$

$P = 150,000$

$G_1 = 60,000$

$F = 15,000$

	Alternatives	
	A	B
Investment (Rs)	-1,50,000	-1,75,000
Annual equal return (Rs)	+60,000	+70,000
Salvage value (Rs)	+15,000	+35,000

Determine the best alternative based on the annual equivalent method if  $i = 25\%$  2022E [C0:4] [5 Marks]

$$\begin{aligned} \therefore A &= -150,000 (A|P, 25\%, 5) + 60,000 + 15,000 (A|F, 25\%, 5) \\ &= -150,000 (0.3718) + 60,000 + 15,000 (0.1218) \\ &= -55,770 + 60,000 + 1,827 \\ &= ₹ 6,057 \end{aligned}$$

ALTERNATIVE B

$A = ? \quad | \quad P = 175,000 \quad | \quad G_1 = 70,000 \quad | \quad F = 35,000$

$$\begin{aligned} \therefore A &= -175,000 (A|P, 25\%, 5) + 70,000 + 35,000 (A|F, 25\%, 5) \\ &= -175,000 (0.3718) + 70,000 + 35,000 (0.1218) \\ &= -650,65 + 70,000 + 4,263 = ₹ 9,198 \end{aligned}$$

Thus, B is better alternative as B has greater annual equivalent worth.

[b] Consider the following two mutually exclusive alternatives.

~~2022~~ 22?

	Alternative A	Alternative B
Cost(Rs.)	40,000	60,000
Uniform annual benefit(Rs.)	6400	9600
Useful life(years)	20	20

Using a 15% interest rate, determine which alternative should be selected based on the future Worth method of comparison.

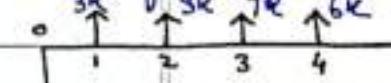
- 2 b Investment proposals A and B have the net cash flows as follows:

	End of Year				
	0	1	2	3	4
A (Rs.)	-10,000	3,000	3,000	7,000	6,000
B (Rs.)	-10,000	6,000	6,000	3,000	3,000

The present worth of A with that of B at rate of interest = 18%. Which proposal should be selected? 2019 S

Present worth of A at  $i=18\%$ .

The cash flow diagram of proposal A



10,000

The present worth is computed as,

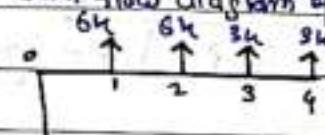
$$\begin{aligned}
 PW_A (18\%) &= -10,000 + 3,000 (P/F, 18\%, 1) + 3,000 (P/F, 18\%, 2) \\
 &\quad + 7,000 (P/F, 18\%, 3) + 6,000 (P/F, 18\%, 4) \\
 &= -10,000 + 3,000 (0.8475) + 3,000 (0.7182) \\
 &\quad + 7,000 (0.6086) + 6,000 (0.5158) \\
 &= \text{₹} 2,052.10
 \end{aligned}$$

Present worth of B is  $i=18\%$ .

The present worth of the above cash is,

$$\begin{aligned}
 PW (18\%) &= -10,000 + 6,000 (P/F, 18\%, 1) + \\
 &\quad 6,000 (P/F, 18\%, 2) + 3,000 (P/F, 18\%, 3) + 10,000 \\
 &\quad + 3,000 (P/F, 18\%, 4) \\
 &= -10,000 + 6,000 (0.8475) + 6,000 (0.7182) + 3,000 (0.6086) \\
 &\quad + 3,000 (0.5158) \\
 &= \text{₹} 2,767.40
 \end{aligned}$$

Cash flow diagram of proposal B



10,000

∴ At  $i=18\%$ , the PW of proposal B is higher than proposal A.

Therefore, Select proposal B.

- Q3 A person deposits Rs. 200 at the end of every month for 5 years in a saving bank account that pays interest @ 4% p.a. compounded monthly. Find the amount in his account at the end of 5 years. 2023E

Given,  $A = 200$

$n = 5 \times 12 = 60$

$i = 0.04 / 12 = 1/300$

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

$$\Rightarrow A(60, 1/300) = 200 \left( \frac{(300/1)^{60} - 1}{1/300} \right)$$

$$= \boxed{\text{₹} 13,260}$$

- (ii) A certain individual firm desires to determine which of the two machines is attractive in a given interval of time. The minimum attractive rate of return for the firm is 15%. The following data are to be used in the analysis.

MACHINE X

$$P = \text{₹}150\text{K}$$

$$n = 12 \quad i = 15$$

$$S = 0 \quad A = 0$$

	Machine X	Machine Y
First cost	1,50,000	2,40,000
Estimated cost	12 years	12 years
salvage cost	0	6,000
annual maintenance cost	0	4,500

Which machine would you choose? Base your answer on annual equivalent cost. 2011E 4

↓  
150,000

The annual Equivalent cost

expression of the above cash flow diagram is

$$\begin{aligned} AE(X) &= 150,000 (A/P, 15, 12) \\ &= 150,000 (0.1845) \\ &= ₹27,675 \end{aligned}$$

The annual equivalent cost of machine X is less than Y.

So, machine X is more cost effective machine.

MACHINE Y

$$P = \text{₹}240\text{K}$$

$$n = 12$$

$$i = 15$$

$$A = 4500$$

$$S = 60000$$

$$240\text{K}$$

↓  
4.5K  
4.5K  
4.5K  
4.5K  
4.5K  
4.5K

The annual equivalent cost of the above cash flow is.

$$\begin{aligned} AE(Y) &= 240\text{K} (A/P, 15, 12) + 4000 \\ &\quad - 6000 (A/F, 15, 12) \\ &= 240\text{K} (0.1845) + 4000 - 6000 (0.09) \\ &= ₹48,573 \end{aligned}$$

17. The value of a machine depreciates from Rs. 16560 to Rs. 6245 in 6 years. What is the annual rate of depreciation? 2023E

$$\text{initial value} = \text{₹}16560 = P$$

$$\text{depreciated value} = 6245 = DV$$

$$n = 6 \quad r = ?$$

$$\text{use, } DV = P (1 - r/100)^n$$

$$\Rightarrow (1 - r/100) = \sqrt[6]{\frac{16560}{6245}}$$

$$\Rightarrow 1 - r = 1.1764$$

$$\Rightarrow r = -17.64\%$$

Rate of depreciation is 17.64%.

a) Cost of using aluminium metal  
for the jet engine part:

- 1(b) In the design of a jet engine, the designer has a choice of specifying either an aluminum alloy casting or a steel casting. Either material will provide equal service, but the aluminum casting will weigh 1.2 Kg. as compared with 1.35 Kg. for steel casting. The aluminum can be cost Rs. 80.00 per Kg. and the steel one for Rs. 35.00 per Kg. The cost of machining per unit is Rs. 150.00 for aluminum and R. 170.00 for steel. Every Kilogram of excess weight is associated with a penalty of Rs. 1300 due to increased fuel consumption. Which material should be specified and what is the economic advantage of the selection per unit? 2019E

Weight of Aluminium casting / unit = 1.2 kg

Cost of making aluminium casting = ₹ 80.00 per kg

Cost of machining al casting per unit = ₹ 150.00

$$\therefore \text{Total cost of jet engine} = 80 \times 1.2 + 150 \\ (\text{Al}) = ₹ 246$$

b.) Cost of jet engine part made of steel, - unit

Weight of steel casting / unit = 1.35 kg

Cost of making steel casting = ₹ 35.00 per kg

Cost of machining steel casting per unit = ₹ 170.00

Penalty of excess weight of steel casting = ₹ 1300 per kg

$$\therefore \text{Total cost of jet engine} = 35 \times 1.35 + 170 + 1300 (1.35 - 1.2) \\ (\text{Steel}) = ₹ 412.25$$

Since, the cost is less, Aluminium parts should be used.

$$\text{Eco. advantage} = 412.25 - 246 = ₹ 166.25$$

- 1b A concrete aggregate mix must contain at least 31% sand by volume for proper batching. One source of material, which has 25% sand and 75% coarse aggregate, sells for Rs 3 per cubic meter ( $m^3$ ). Another source, which has 40% sand and 60% coarse aggregate, sells for Rs. 4.40 per cubic meter ( $m^3$ ). Determine the least cost per cubic meter of blended aggregates. 2016E/2017G

Let  $n$  = Portion of blended agg. from ₹ 3.00/ $m^3$  src  
 $1-n$  = " " " ₹ 4.40/ $m^3$  src

Sand balance,

$$n(0.25) + (1-n)0.4 = 0.31 \Rightarrow 0.15n = -0.09 \\ \Rightarrow n = 0.60$$

$\therefore$  The 60% / 40% blended aggregate will cost,

$$0.60(3) + 0.4(4.40) = 1.80 + 1.76 \\ = ₹ 3.56/ $m^3$$$

b.

For construction purpose, a concrete aggregate mix is required which should contain at least 34% sand by volume. We have following option available:

2013E

	Sand	Coarse	Rate
One source material	30%	70%	Rs. 3.50 per cubic meter
Second source material	42%	58%	Rs. 4.25 per cubic meter

Determine the least cost per cubic meter of blended aggregates.

Sand balance

$$\begin{aligned}
 \text{Similarly, } & x(0.3) + (1-x)(0.42) = 0.34 \\
 \Rightarrow & 0.42 - 0.34 = 0.12x \\
 \Rightarrow & x = 0.08 = \frac{2}{24} = \frac{1}{12} \\
 & \therefore \frac{2}{3}(3.5) + \frac{1}{3}(4.25) \\
 & \qquad \qquad \qquad \approx \\
 & \therefore \frac{2}{3}(3.5) + \frac{1}{3}(4.25) = \text{₹}3.75/\text{m}^3
 \end{aligned}$$

c.

A special type of screw is manufactured at a unit cost of Rs. 4 for material and Rs. 5.5 for direct labour. An investment of Rs. 6,00,000 is required to purchase the machine. Other cost is 1.5 times Direct labour cost. The order calls for three million pieces. Half-way through the order, a new method of manufacture can be put into effect which will reduce the unit costs of Rs. 3 for material and Rs. 4.5 for direct labour—but it will require Rs 1,00,000.00 for additional machine. Which process should be taken up?

2012E  
2013E

Our problem only concerns the

second half of the order, as there is only one alternative for the first 1.5 million pieces.

∴ Change in method is economic  $\rightarrow$  advantage = ₹ 5,50,000

	Continue with present Method	Change manufac Method
Material cost	= 1,50,00,000 × 4 = ₹ 60,00,000	= 15,00,000 × 3 = ₹ 45,00,000
Direct Labour cost	= 15,00,000 × 5.5 = ₹ 82,50,000	= 15,00,000 × 4.5 = ₹ 67,50,000
Other cost	= 1.5 × DLC = ₹ 23,75,000	= 1.5 × DLC = ₹ 1,01,25,000
Cost of add <sup>n</sup> machine	—	₹ 1,00,000
Cost of remaining 1.5m pieces	₹ 2,62,50,000	₹ 2,47,50,000

b) The green houses have the following cost comparison during their life time production system. Find out which system is more economical if the rate of interest is 15% compounded annually.

2013E

	System A	System B
Initial Cost in Rs.	30,000	20,000
Maintenance Cost/year in Rs.	1000	2500
Replacement of a component at the end of every third year in Rs.	4000	4200
Salvage value in Rs.	5,000	-
Life in Years	20	20
Benefit from quality control as uniform end of year amount/year	1000	-

- I(C) The chief engineer of refinery operation is not satisfied with the preliminary design for storage tanks to be used as part of a plant expansion programme. The engineer who submitted the design was called in and asked to reconsider the overall dimensions in the light of an article in the "Chemical Engineer", entitled "How to size future process vessels"?

The original design submitted called for 4 tanks 5.2 m in diameter and 7 m in height. From a graph of the article the engineer found that the present ratio of height to diameter of 1.35 is 111% of the minimum cost and that the minimum cost for a tank was when the ratio of height to diameter was 4:1. The cost for the tank design as originally submitted was estimated to be Rs. 9,00,000. What are the optimum tank dimensions if the volume remains the same as the original design? What total savings may be expected through the redesign?

2019 E

Date : / /

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Given,

$$\text{no. of tanks} = 4$$

ORIGINAL DESIGN

$$\text{diameter} = 5.2 \text{ m}$$

$$\text{radius} = d/2 = 2.6 \text{ m}$$

$$\text{height} = 7 \text{ m}$$

$$\therefore \text{Ratio } (h/d) = 1.35$$

Original design ~~assum~~

Volume / tank :

$$= \pi r^2 h = \pi (2.6)^2 \times 7 = 148.72 \text{ m}^3$$

New Design

$$\text{optimal } (h/d)_{\text{ratio}} = 4:1$$

$$\Rightarrow d = h/4 \Rightarrow r = d/2 \Rightarrow r = h/8$$

$$\therefore \text{Volume} = \pi r^2 h = 148.72 \text{ m}^3$$

$$\Rightarrow \frac{\pi h^3}{64} = 148.72 \Rightarrow h = 14.47 \text{ m}$$

$$\therefore r = h/8 = 1.81 \text{ m}$$

$$\therefore \text{diameter of new design} = 3.62 \text{ m}$$

Given,

cost of the old design = 111% of the cost of optimal design

$$\Rightarrow \text{Cost of opt des} = 900,000 \times 100/111 = ₹ 8,10,810.81$$

$$\therefore \text{Expected saving} = \Delta = 90 \text{ Dk} - 810,810.81$$

$$= ₹ 89,189.18$$

b) An almirah making firm has two options. Either it can use galvanised iron or aluminium as raw material. Both the materials provide equal services. Aluminium sheet costs Rs.90/m<sup>2</sup>. And galvanised iron sheet costs Rs.70/m<sup>2</sup>. Sheet of 60 m<sup>2</sup> size is required. The cost of finishing and bending of galvanised iron almirah is Rs.5000 while for aluminium, it is Rs.6050. If aluminium is used as raw material, it is joined by rivets, which costs Rs. 1250 per almirah. While for galvanised iron, it is Rs.1700 as spot welding is used. The transportation cost for each extra kilogram of weight is

Rs.850. an almirah made by galvanised iron weighs 2 kg heavier than that made from aluminium. Find the better option and calculate economic advantage if all other costs incurred are same.

2020 S

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S. No.	Detail	Aluminium	Galvanised Iron
a)	Cost of Sheet /m <sup>2</sup>	₹ 90.	₹ 70.
b)	Cost of Sheet = cost of sheet × size reqd $90 \times 60$ $= ₹ 5400$	70 × 60 $= ₹ 4200$	
c)	Cost of making Almirah = Finishing, bending + Rivet/spot welding $6050 + 1250$ $= ₹ 7300$	5000 + 1200 $= ₹ 6200$	
d)	additional transportation cost = additional cost /kg + additional weight $850 \times 2$ $0$ $= ₹ 1700$	-	
	Total cost = a + b + c + d.	₹ 12,700	₹ 12,600

So, galvanized iron is more economical

$$\text{Economic advantage / Almirah} = 12700 - 12600 = ₹ 100.$$

Q) In the design of building to be constructed at Alpha state, the designer is considering the type of window frame to specify. Either steel or aluminum window frames will satisfy the design criteria. Because of the remote location of the building site and lack of building materials in alpha state, the window frames will be purchased in Beta state and transported for a distance of 2,500 Km to the site. The price of window frames of the type required is Rs1,000 each for aluminum frames. The weight of steel window frames is 75 kg each and that of aluminum window frame is 28 Kg each. The shipping rate is Rs.1/Kg/100Km. Which design should be specified and what is the economic advantage of the selection?

2016 3

Distance between Alpha and Beta State = 2,500 Km

Transportation cost = ₹ 1/kg /100km

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## a) Steel Window frame

Price of Steel window frame/unit = ₹ 1000

Weight of Steel window frame/unit = 75 kg

Total cost of Steel window frame/unit

= Price of Steel window/unit

+ transp. cost of SW /unit

$$= 1000 + (75 \times 2500 \times 1) / 1000$$

$$TC_{Steel} = ₹ 2875$$

## b) Aluminum window frame

Price of Al window frame/unit = ₹ 1500

Weight of Al window frame/unit = 28 kg.

Total cost of Al window frame/unit

$$= 1500 + (28 \times 2500 \times 1) / 1000$$

$$TC_{Al} = ₹ 2200$$

Since  $TC_{Steel} > TC_{Al}$ , aluminum frame is Recommended.Economic Advantage per unit =  $2875 - 2200 = ₹ 675$ .

- i) In the design of a cold-storage, the specifications call for a maximum heat transfer through the walls of 35,000 joules/hr/sq meter of wall when there is a 35°C temperature difference between the inside and outside surface of the insulation. The two insulating materials being considered are as follow:

2012 E

Insulation Material	Cost/cubic meter	Conductivity Jm/m <sup>2</sup> °C hr
Rock Wool	Rs. 255.00	135
Foamed insulation	Rs. 310.00	115

The basic equation for the heat conduction through a wall is  

$$Q = \{K(\Delta T)\}L$$
where  $Q$  = Heat transfer in J/hr/m<sup>2</sup> of wall $K$  = Conductivity in Jm/m<sup>2</sup>°C hr $\Delta T$  = Difference in temperature between two surfaces in °C

L = Thickness of insulating material

which insulation material should be selected?

Two steps required to solve the problem :

i) the required thickness of each material must be calculated.

ii) since the problem is of providing a fixed output, the output is to minimize the input (cost).

S.No	Detail	Rock Wool	Foam Insulation
a.	$Q = \{K(\Delta T)\}L \Rightarrow L = ?$	$L = \frac{135 \times 35}{35000} = 0.135$	$L = \frac{115 \times 35}{35000} = 0.115$
b.	Cost of insulation / sq meter of wall $= \text{cost/m}^3 \times \text{Insulation thickness (in m)}$	$255 \times 0.135 = ₹ 34.425$	$310 \times 0.115 = ₹ 35.65$

As cost of wool is further, Rock wool should be chosen | Advantage > ₹ 1.22/-

(b) Two alternatives are under consideration for a tapered fastening pin. Either design will serve the purpose and will involve the same material and manufacturing cost except for the lathe and grinder operations.

Design A will require 16 hours of lathe time and 4.5 hours of grinder time per 1000 units Design B will require 7 hours of lathe time and 12 hours of grinder time per 1000 units. The operating cost of the lathe including labour is Rs.200/hour The operating cost of the grinder including labour is Rs.150/hour which design should be adopted if 1,00,000 units are required/year and what is the economic advantage of the best alternatives?

3

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$$\text{Operating cost of Lathe with labour} = ₹ 200/\text{hr}$$

$$\text{Grinder} = ₹ 150/\text{hr}$$

### a) Cost of DESIGN A.

$$\# \text{ hrs of lathe time / 1000 units} = 16 \text{ hr}$$

$$\text{Grinder} = 4.5 \text{ hr}$$

Total cost of design A/1000 units

$$= \text{cost of lathe / 1000 units} + \text{grinder}$$

$$= 16 \times 200 + 4.5 \times 150$$

$$= ₹ 3875$$

$\therefore$  Total cost of design A/100000 units = ₹ 387500

### b) Cost of DESIGN B.

$$= 7 \text{ hr}$$

$$= 12 \text{ hr}$$

$$= 7 \times 200 + 12 \times 150$$

$$= ₹ 3200$$

$\therefore$  Total cost of design B/100000 units = 320000

Cost of B is less so its recommended for making fastening pin with an economic advantage of ₹ 67500

- [b] (i) A manufacturer of motor cycles buys side boxes at Rs.240 each. In case he makes it himself, the fixed and variable costs would be Rs. 30,00000 and Rs90/unit respectively. Should the manufacturer make or buy the side boxes if the demand is 2,500 side boxes? 2015

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### MAKE BOXES

$$\text{total cost of making side boxes} = F.c + (V.C \times \text{units})$$

$$= 3000000 + 90 \times 2500$$

$$=\text{₹ } 32,25,000$$

### BUYING BOXES

$$\text{total cost of buying the boxes} = 240 \times 2500$$

$$=\text{₹ } 600,000$$

Clearly he should buy the motor cycle side boxes.

- (ii) An item has an yearly demand of 1,000 units. The different costs with regard to make and buy are as follows. Determine the best option

Detail	Buy	Make
item cost/unit	Rs.6.00	Rs.5.90
procurement cost/order	Rs.10.00	-
set-up cost/setup	-	Rs.50.00
annual carrying cost/item/year	Rs.1.32	Rs.1.30
production rate/year		6000 units

### MAKE OPTION

$$T_0 = \text{₹ } 50 \text{ /set up}$$

$$(M = 1000 \text{ units / yr})$$

$$C_c = \text{₹ } 1.30 \text{ /unit } \frac{1}{2} \text{ /yr}$$

$$k = 6000 \text{ units / yr}$$

$$Q_2 = \sqrt{2 R_0 k}$$

$$= \sqrt{\frac{C_c(1 - \pi/k)}{2}} \\ = \sqrt{1.30 \left(1 - \frac{1000}{6000}\right)}$$

$$Q_2 = 678.68$$

$$= 6.79 \text{ units}$$

### BUY OPTION

$$D = 1000 \text{ units / yr}$$

$$Q_1 = \sqrt{\frac{C_o D x 2}{C_c}} \\ = \sqrt{\frac{2(10)(1000)}{1.32}} = 123 \text{ units}$$

$$TC = DP + \frac{D C_o}{Q_2} + C_c (k - n) Q_2$$

$$= 5900 + 73.63 + 600 (0.056)$$

$$= 6337.63$$

$$TC = DP + \frac{D C_o}{Q_1} + Q_1 C_c \\ = 1000 \times 6 + \frac{1000 \times 10}{123} + \frac{123 \times 1.32}{2}$$

$$TC = 6162.48$$

1(b) A manufacturer has following option

	Purchase from the market (in Rs.)	Manufacture within the company (in Rs.)
Selling price/unit	6000 with 18% GST per unit	-
Cost of Machine-1	-	4040440 with 18% GST
Cost of Machine-2	-	220400 with 12% GST
Cost of raw material/unit	-	999 with 10% and 08% GST

Annual demand is 1000 units. Suggest to the manufacturer whether he should manufacture or purchase?

2018 E

## PURCHASE

$$(CTC)_P = \left( 6000 + \frac{18 \times 6000}{100} \right) \times 1000 = 70,80,000$$

## MANUFACTURE

$$\text{fixed CTC} = \left( \frac{4040440 + 4040440 \times 18}{100} \right) + \left( \frac{220400 + 220400 \times 12}{100} \right) \\ = 50,14,567.2$$

$$\text{variable CTC} = \left( \frac{999 + 999 \times 10}{100} + \frac{999 \times 2}{100} \right) = 1,178.82$$

$$\therefore (CTC)_M = 50,15,746.02$$

Clearly they should manufacture

If  $C(x) = ax^2 + bx + c$  is the cost function of a monopolist and  $P = \beta - \alpha x$  is the demand law, find the monopoly price and output.

2013 E

$$P(x) = \beta - \alpha x$$

$$\Rightarrow x = \frac{\beta - P}{\alpha}$$

 $\pi(P) = R(P) - C(\pi(P))$  is the profit func.

Profit are maximum if

$$\frac{d\pi(P)}{dp} = 0 \Rightarrow \frac{d(R(p))}{dp} = \frac{dc}{dx} \cdot \frac{dx}{dp}$$

$$\therefore R(p) = p(B/\alpha - P/\alpha)$$

$$\therefore \frac{dR(p)}{dp} = \frac{\beta}{\alpha} - \frac{2p}{\alpha} - (Q)$$

$$\frac{dc}{dx} = 2ax + b$$

$$\frac{dx}{dp} = -1/\alpha$$

$$\therefore \frac{dc}{dx} \cdot \frac{dx}{dp} = -2a\frac{p}{\alpha} - \frac{b}{\alpha}$$

$$= -\frac{2a}{\alpha} \left( \frac{\beta - p}{\alpha} \right) - \frac{b}{\alpha}$$

$$= -\frac{2a\beta}{\alpha^2} + \frac{2ap}{\alpha^2} - \frac{b}{\alpha} - (L)$$

from (Q) and (L) we get

$$\frac{\beta}{\alpha} - \frac{2p}{\alpha} = -\frac{2a\beta}{\alpha^2} + \frac{2ap}{\alpha^2} - \frac{b}{\alpha}$$

$$\therefore \beta + 2a\beta + b = 2p(a/\alpha + 1)$$

$$\therefore p = \frac{\alpha\beta + 2a\beta + ab}{2(\alpha + a)}$$

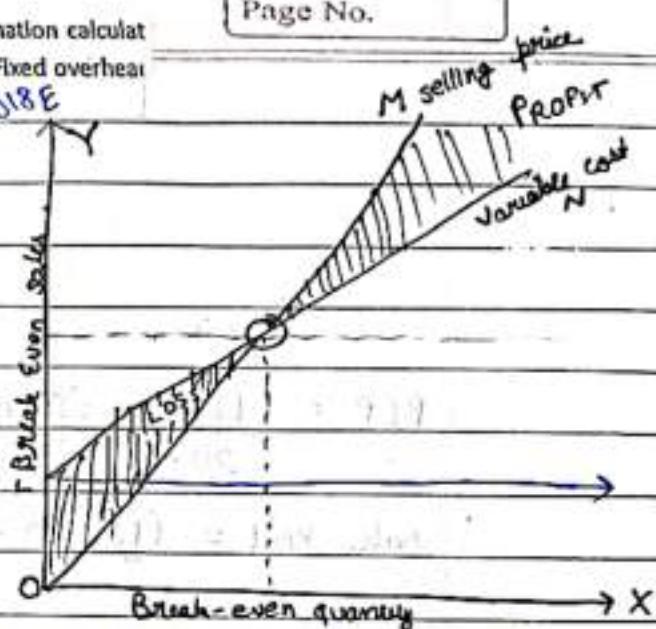
$$\therefore x = \frac{\beta - \alpha\beta + 2a\beta + ab}{2\alpha(\alpha + a)} \Rightarrow x = \frac{(\beta - b)}{2(\alpha + a)}$$

Discuss the concept of Break even point? 2005 M

2

Explain the concept of Break Even Point and from the following information calculate the Break even point and turnover required to earn a profit of 40,000. Fixed overhead is Rs.2,00,000, selling price is Rs.25 and variable cost per unit is Rs.5. 2018 E

The break-even point is the production volume at which total revenue equals total cost, resulting in no profit or loss. It is determined by the intersection of total revenue and total cost lines in a break-even analysis.



The break even analysis considers SP, VC, FC to identify the production volume where the business neither gains nor loses.

$$\therefore \text{Break-Even Pt.} = \frac{\text{Fixed Cost}}{\text{Selling price/unit} - \text{Variable cost/unit}}$$

$$\boxed{\text{BEP} = \frac{\text{FC}}{\text{SP/unit} - \text{VC/unit}}}$$

$$\text{Given, } \text{FC} = \text{₹}2,00,000$$

$$\text{VC} = \text{₹}5/\text{unit}$$

$$\text{SP} = \text{₹}25/\text{unit}$$

$$\therefore \text{BEP} = \frac{2,00,000}{25 - 5} = \boxed{\text{₹}10,000}$$

Turnover reqd,

$$\text{Sales at reqd profit} = (\text{FC} + \text{Desired Profit}) \times 100$$

P/V ratio

$$= \frac{(2,00,000 + 40,000)}{25 - 5} \times 25$$

$$= 240,000 \times \frac{5}{4} = 60,000 \times 5 = 300,000$$

$$= \boxed{\text{₹}3,00,000}$$

(b) From the following information calculate the break-even point and the turnover (sales) required to earn a profit of Rs 36000.

Fixed overheads	Rs. 16000
Variable cost per unit	Rs. 2
Selling price	Rs. 20

1000000

$$FC = 18000$$

$$VC/unit = 2$$

$$S^2 / \text{unit} = 20$$

$$\text{desired profit} = 36000$$

$$BEP = \frac{18000}{20-2} = \boxed{1000}$$

$$\text{Sales at BEP, } = \frac{18000 \times 20}{20 - 2} = \text{£20k}$$

$$\text{Sales Tax} = \frac{(18000 + 36000) \times 20}{18} = 3000 \times 20 = \boxed{\$60,000}$$

$$\begin{aligned}\text{margin of safety} &= \text{Sales Read} - \text{BEP Sales} \\ &= 60,000 - 1000 \times 20 \\ &= \boxed{\pm 40,000}\end{aligned}$$

A company is producing tire. Cost of machine is Rs. 261,000. Cost of labour and raw material is @Rs. 160/tire. Manufacturer sells tire @ Rs.450/tire. What will be the break even point for the company?

• 2012F/ 2013G

Clearly, cost of machine = Fixed cost,  $FC = ₹ 261,000$   
 cost of  $\frac{\text{labour} +}{\text{Raw material}}$  Var. cost,  $VC = ₹ 160/\text{tyre}$   
 selling price,  $SP = ₹ 450/\text{tyre}$ .

$$\therefore \text{BEP} = \frac{\text{FC}}{\text{SP} - \text{VC}} = \frac{26100}{450 - 160} = \frac{26100}{29} = 900$$

(iii) A company is producing tyre. Cost of machine is Rs.261,000. Cost of labour and raw material is @Rs.350 and Rs.110 per tyre respectively. It sells in the market @ Rs.450/tyre. What will be the break even point for the company? 2012E 3

- (b) A company earned a profit of Rs.60000 during the current year. If the average variable cost and selling price of a product is Rs.20 and Rs.25 per unit respectively, find out the margin of safety.

Profit > 60.000,-

Variable cost /unit,  $v = 20/-$

Selling price of unit,  $s = 25/-$

$$\therefore \text{Margin of Safety} = \frac{\text{Profit}}{S-V} = \frac{60K}{25-20} = \frac{60K}{5} = 12K$$

MOS = ₹ 300,000

- 3.b A computer producing company can either purchase the screen or can manufacture within the company. The Detail is given below

	Purchase	Manufacture
Price per screen	4000	
Tax rate	(@ 10% per unit)	
Cost of machine		20 lakh
Cost of labour		2000/unit
Cost of raw material		1000/unit
Overhead Cost		400/unit

2016  
2017 E

If the annual demand is 2200, the company should make or buy.

PURCHASE

$$\text{price} = 4000/\text{unit}$$

$$\text{tax} = 10\% \times 4000/\text{unit} = 400/\text{unit}$$

∴ cost to fulfill demand

$$= (4400) \times 2200$$

$$=\text{₹ } 96,80,000$$

The company should make

MANUFACTURE

$$\text{cost of machine, } FC = 2000000$$

$$\text{cost of labour} = 2000/\text{unit}$$

$$\rightarrow \text{raw mat} = 1000/\text{unit}$$

$$\rightarrow \text{overhead} = 400/\text{unit}$$

$$\therefore \text{variable cost, } VC = 2400/\text{unit}$$

$$\text{cost to fulfill demand} = FC + VC \times 2200$$

$$= 2000000 + 2400 \times 2200$$

$$= \text{₹ } 548,000$$

- 1(b) If a company earned a profit of Rs.50000 during the year 1994-95. If the marginal cost and selling price of a product are Rs.10 and Rs.15 per unit respectively, find out the margin of safety.

2018 S

$$\text{Profit} = 50000$$

$$VC/MC = 10$$

$$SP = 15$$

$$\therefore \text{Margin of Safety} = \frac{50000}{15 - 10} = \text{₹ } 150000$$

- 1(a) Break-even analysis is a very important analytical technique used to study the relationships between costs, revenues and profits. Explain

2018 E

In the context of engineering economics, break-even analysis involves identifying and differentiating between fixed and variable costs. Fixed costs remain constant regardless of the production output, such as rent, salaries, and depreciation. Variable costs, on the other hand, change directly with the production quantity, such as raw materials and labor costs.

The break-even point (BEP) is the production level where the total revenue generated equals the total costs incurred. It represents the number of units that must be sold to achieve a zero profit margin. The BEP can be calculated using the following formula:

$$\text{BEP} = \text{Fixed Costs} / (\text{Selling Price per Unit} - \text{Variable Cost per Unit})$$

Break-even analysis provides valuable insights into the cost structure of a business or project and its sensitivity to changes in production volume, selling prices, and variable costs. It also helps assess the impact of pricing strategies on profitability and the ability to generate profits beyond the break-even point.

Date : / /

Page No.

demand = 2200 units

6(a) If you are CEO of an MNC, discuss Business Risk which you will consider while deciding location for your foreign venture. **2018E**

7.a Discuss factors which should be considered while deciding location of the firm abroad. **2016E** 5

3. Discuss factors which should be considered while deciding location of the firm abroad. **2017E** 5

6[a] A company wants to open its office abroad. Discuss about the anticipated business risks it should take care of. **2012S** 7

3 a As a C.E.O. of a company, what measures you should take in deciding foreign location for your company? Discuss. **2019S** 5

7(a) Discuss Business Risk which you will consider while deciding location for your foreign venture. **2018S** 5

5[a] Discuss Business risk in globalized market. **2018E** 7

In a globalized market, businesses face risks when venturing into foreign territories. These are

- **INTERNAL / ORGANISATIONAL**

→ To get the benefit of world wide market imperfections.

→ To avail the opportunities that arise along with life cycle of products.

- **EXTERNAL / ORGANIZATIONAL**

→ Responding to macroeconomic imperatives for globalization.

→ Exploiting the competitive advantage of firms.

A firm must take a comparative risk analysis while considering the following:

1/1 Discuss socio-economic factors which need to be considered while deciding foreign location of your company. **2023E**

### 1. ECONOMIC INDICATORS

- Evaluate macroeconomic indicators like GDP, inflation rate, taxation, unemployment rate and BOP
- Assess microeconomic variables like physical infrastructure, availability, quantity and time taken for essential services (electricity, roads).
- Consider the availability of raw materials, skilled manpower and the overall structure of the market.

### 2. FINANCIAL INDICATORS

- Analyze the status of money and capital markets in the prospective location.
- Evaluate the time taken to secure bank loans and potential impact of local currency devaluation.

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### 3. POLITICAL INDICATORS

- Assess macro political indicators such as external wars, internal conflicts, terrorist activities, unstable government and, law and order situations.
- Consider micro political indicators including official disposition and the time taken to obtain necessary permissions.

### 4. SOCIAL INDICATORS

- Evaluate societal attractiveness and acceptance of foreign citizens.
- Analyze law and order situation and the institutional framework in place.
- Consider how these social factors might affect the firm's performance in a particular location.

### 5. LEGAL INDICATORS

- Evaluate the legal framework in the prospective location.
- Consider the degree to which legal regulations are implemented, as this can have a significant impact on the growth of an international venture.

Thus, we conduct a thorough cost and benefit analysis, weighing the risks and potential rewards in each location.

(b) What do you mean by sales forecasting? Discuss various methods of sales forecasting. [2012 (EEE) Q]

2012 (EEE) Q

Sales forecasting is the process of estimating the future demand for a product or service in order to make informed decisions about the business. It helps businesses plan and allocate resources effectively. Various methods of sales forecasting include :-

#### 1.) SURVEY OF BUYER'S OPINION:

It's a direct method for short-term forecasting and involves asking customers about their future buying intentions.

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Advantages: direct user response, time and cost effective.

Disadvantages: irregular buying intentions, difficulty in foreseeing changes.

### 2.) COLLECTIVE OPINION / SALES PERSON'S POLLING

It is a simple method without mathematical techniques based on salesmen's estimates due to their close observation of customer behaviour.

It is useful for short term forecasting, especially for new products.

### 3.) DELPHI METHOD

It is an iterative process based on the judgement of a panel of experts providing anonymous responses, where experts' successive answers till a convergent view is reached.

Advantages: nimble, expert based, reliable info.

Disadvantages: bias in expert estimation, useful for short term.

### 4.) TRENDS THROUGH REGRESSION METHOD:

It involves establishing a relationship b/w demand and economic indicators.

Regression equation ( $y = a + bx$ ) is derived to forecast demand based on independent variables.

Advantages: more precise.

Disadvantage: relies on past data, accuracy depends on measure of independent variable.

✓ Discuss factors which should be considered while deciding price of the product in the market.

2013E

- 2(a) If you are CEO of a company, discuss factors which you will consider while deciding price of your product in the market.

2019S

- 1.) Demand Dynamics: Consider the <sup>elasticity of</sup> demand, understanding how sensitive quantity demanded is to price changes. Inelastic demand allows for higher prices while elastic demand may require competitive pricing.

- 2.) Market Environment: Assess the market structure and competition. Monopolies may have more pricing flexibility, while competitive markets necessitate careful consideration.

- 6.1) You are CEO of an Oligopolistic company. What are the [5][CO#3] factors you should consider while deciding price of your product. 2023E

of competitor's price.

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- 3) Cost and Profitability: Analyze production costs, ensuring that pricing covers both fixed and variable costs to maintain profitability.
- 4) Consumer Factors: Take into account customer income levels, the impact of advertising, and cross-elasticity with related products. Luxury goods may be more elastic concerning income, while advertising can influence demand.
5. Long-Term Planning: Consider the product's growth potential and sensitivity to changes in population structure and income levels for effective long-term planning. Conduct thorough market surveys to gather statistical info. and assess demand functions.

- 4(a) Explain the role of risk, uncertainty and innovation in the determination of profit. 2018E

..... Semester

**B.Tech/B.Des./BBA/BAE/M.Sc./M.Des./M.Tech./MB****A/Ph.D./B.Tech.(Eve)****MID TERM EXAMINATION**

Sept 2022

**HU 301 Engineering Economics**

Time: 1.30 Hours

**Max.Marks: 25**

Note: All questions are compulsory

All questions carry equal marks.

Assume suitable missing data, if any.

**Q1.** (a) What is law of Demand? What are the exceptions to the law of demand? [2.5 Marks]

(b) Define Cross elasticity of demand and if cross price elasticity of demand for good X & Y is equal to -1.5 what is the relationship between goods X & Y. if the price of Y increases by 10% what is the percentage change in quantity demanded of X. [2.5 Marks] [ CO: 1]

**Q2.** (a) Explain the law of equi marginal utility and determine the consumer's equilibrium using given information [5 Marks] [CO: 1]

Price of X = Rs.4

Price of Y = Rs.5

Total money income = Rs. 35

No of units consumed MU<sub>x</sub> MU<sub>y</sub>

1	40	55
2	36	50
3	32	30
4	28	20
5	24	15
6	20	5

**Q3.** What is monetary policy? Explain the tools of monetary policy to control inflation. [5 Marks] [CO: 2, 3]

**Q4.(a)** Explain the likely behavior of Total product and marginal product when only one input is increased for increasing production while all other inputs are kept constant. [2.5 Marks]

(b) What is the meaning of market in economics and what are various forms of market. [2.5 Marks] [CO: 1,2]

**Q5.** Write short notes on any 2 of the following:

(a) Free trade and protectionism

(b) Dumping

(c) Balance of payment and Balance of Trade

(d) Direct taxes and indirect taxes

[ 5 Marks] [ CO: 3,4]

Total No. of Pages-1

Roll No. ....

Vth Semester

B.Tech.

Mid-Term Examination

September' 2023

**HU 301 Engineering Economics**

Time- 1.30 hrs

Marks- 25

- Note: 1. All questions are compulsory.  
 2. All questions carry equal marks.  
 3. Assume missing value, if any

- What do you mean by Economics? Discuss its relevance for engineering students. [2+3=5]  
[CO#i&3]
- Discuss differences between National Trade and International Trade. [5][CO#1]
- Differentiate between Monetary Policies and Fiscal Policies. [5][CO#2]
- Is Perfect Competition a real world situation? Argue your point. [5][CO#3]
- You are CEO of a company. Price Elasticity of demand for your product is more than unit. What type of the product may be? Also discuss pricing policies for it. [5][CO#3]

*Total No. of Pages-4**Roll No. ....***Vth Semester****B.Tech.****End Term Examination****Nov./Dec.- 2023****HU 301 Engineering Economics****Time- 3.00 hrs****Marks- 50**

- Note: 1. Answer any five questions.  
 2. All questions carry equal marks.  
 3. Assume missing value, if any

- 1 a Discuss salient feature of the Indian economy. [5][CO#1]  
 b The accounts of ABC manufacturing LTD. for the [5][CO#2] year ended 31st March 2023 shows following:

Particular	Rs.
Stock of Material on 01.4.2022	87,200
Materials purchased	369000
Drawing office salaries	40000
General office salaries	15000
Bad debts written off	12000
Salesperson's salary & commission	17000
Depreciation written off of furniture	10000
Rent, tax and insurance of factory	41900
Productive Wages	176400
General expenses	40000
Gas and water (factory)	2680
Travelling expenses	2680
Managers Salary	75000
Depreciation of plants and tools	9,100
Cash discount allowed	4060
Repair pf plats and tools	6230
Carries outwards	6030
Direct expenses	10010
Rent, taxes, insurance (office)	2800
Gas, water (office)	560
Stock of material 31.3.2023	87920

Prepare cost seat for the year ending 31.3.2023

- 2 a Think one product of the Indian market whose market is oligopoistic and one product whose market is monopolistic competition. Discuss reasons for your decision. [5][CO#3]

- b A mall owner is taking stock of his expenditure on advertisement. It has increased its expenditure from 50 thousand to Rs. 75 thousand each on advertisement of commodity X1 and X2. Statistics on its pre and post advertisement sell is given below:

Commodity	Pre-advertisement sell	Post advertisement sell
X1	3 lakh	3.12 lakh
X2	5 lakh	7.70 lakh

Find out their advertisement elasticity and nature of X1 and X2.

- 3 a You are CEO of a company and you have to decide a foreign location where you would like to expand your business. Discuss factors you would like to consider for taking decision. [5][CO#3]

- b If price of A changes from 20 to 25 per unit, following are the detail of demand of A, B and C. Calculate the Cross Elasticity of Demands and find the relation between the commodity A, B and C. [5][CO#2]

Commodity	Demand	
	Original	Changed
A	100	80
B	120	150
C	200	160

- 4 a What do you mean by opportunity cost? How it is different from actual cost? Discuss with examples [2+3=5]  
[CO#2]
- b A small business with an initial investment of Rs. 12,000 yields Rs. 10,000 during the first year of operation and the yield increases by Rs. 1,000 from its second year of operation up to its 10<sup>th</sup> year of operation. At the end of life of the business, the salvage value is zero. Find the present worth of the business by assuming an interest rate of 18%, compounded annually. [5][CO#2]

- 5 a You are Governor of the Central Bank, country ABC. The inflation rate has become 9. Is it a matter of concern? What fiscal and monetary measures may be taken and why? Discuss with examples. [5][CO#3]
- b A man owns a corner plot. He must decide which of the two alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, he decides that there are two best alternatives. Details are given below: [5][CO#2]

	Build Gas station	Build Ice-cream stand
Initial Investment (in Rs)	20,00,000	36,00,000
Annual Property Tax (in Rs.)	80,000	1,50,000
Annual Income (in Rs)	8,00,000	9,80,000
Life of Building (in Years)	20	20
Salvage Value (value which owner may receive after completing life) (in Rs.)	0	0

Evaluate the alternative based on the future worth method.

- 6 a What do you mean by Online work? Is it good or bad type of employment? Whether engineering students should be encouraged to do it? Discuss with examples. [5][CO#3]
- b A company invests in one of the two mutually exclusive alternatives. The life of both alternatives is estimated to be 5 years with the following initial investments, annual return and [5][CO#2]

salvage value (money received after selling the machine at the end of its operational life)

	Alternative A	Alternative B
Initial Investment (in Rs.)	1,50,000	1,75,000
Annual Equal Return (in Rs.)	60,000	70,000
Salvage value (in Rs.)	15000	35000

Determine the best alternative based on the annual equivalent method when rate of interest is 25%.

- 7 a What do you understand by Recession? Discuss its effect on producers, employees of a manufacturing firm and students. [2+3=5][CO#2]
- b Excel manufacturing firm to expand its production operation. It has identified three different technologies for meeting the goal. The initial investment and annual expenditure with respect to each of the technologies is given below. [5][CO#3]

*	Initial Investment (in Rs)	Annual Maintenance cost	Life (in years)
Technology 1	12,00,000	4,00,000	10
Technology 2	20,00,000	6,00,000	10
Technology 3	18,00,000	5,00,000	10

Suggest the best technologies which is to be adopted based on the present worth method of comparison assuming 20% interest rate compounded annually.