ESE 2017

UPSC ENGINEERING SERVICES EXAMINATION

Preliminary Examination

Paper I

General Studies and Engineering Aptitude

2

Engineering Aptitude covering Logical reasoning and Analytical ability

Comprehensive Theory *with* Practice Questions

As per new syllabus of ESE 2017

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ESE-2017 : Preliminary Examination
Paper-I : General Studies and Engineering Aptitude

Engineering Aptitude covering Logical reasoning and Analytical ability

1st Edition : 2016

Preface

B. Singh (Ex. IES)

The compilation of this book **Engineering Aptitude covering Logical reasoning and Analytical ability** was motivated by the desire to provide a concise book which can benefit students to understand the concepts of aptitude and reasoning topics.

This textbook **Engineering Aptitude covering Logical reasoning and Analytical ability** provides all the requirements of the students, i.e. comprehensive coverage of theory, fundamental concepts and objective type questions articulated in a lucid language. The concise presentation will help the readers grasp the theory of this subject with clarity and apply them with ease to solve objective questions quickly. This book not only covers the syllabus of ESE but also addresses the need of many other competitive examinations. Topics like 'Arithmetic, Algebra & Geometry, Reasoning & Data Interpretation' are given full emphasis, keeping in mind of our research on their importance in competitive examinations.

We have put in our sincere efforts to present detailed theory and MCQs without compromising the accuracy of answers. At the end of each chapter, sets of practice question are given with their keys, that will allow the readers to evaluate their understanding of the topics and sharper their question solving skills.

Our team has made their best efforts to remove all possible errors of any kind. Nonetheless, we would highly appreciate and acknowledge if you find and share with us any printing and conceptual errors.

It is impossible to thank all the individuals who helped us, but we would like to sincerely thank all the authors, editors and reviewers for putting in their efforts to publish this book.

With Best Wishes

B. Singh

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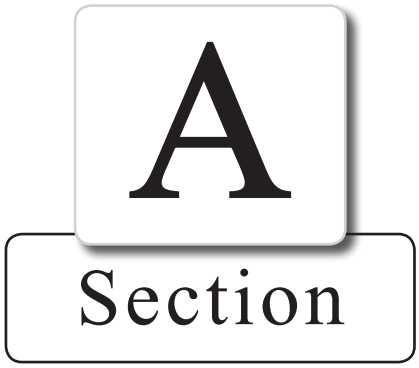

Arithmetic

1.5
CHAPTER

UNIT-1

Profit and Loss

Profit and loss are part and parcel of every commercial transaction. In fact, the entire economy and concept of capitalizm is based on the so called 'profit and loss'.

Business transactions have now-a-days become common feature of life. When a person deals in purchase and sale of any item, he either gains or loses some amount generally. The aim of entire business is to earn profit.

The commonly used term in dealing with questions involving sales and purchase are:

Cost Price

The cost price of an article is the price at which an article has been purchased. It is abbreviated as C.P.

Note: Cost price can also be written as CP only.

Selling Price

The selling price of an article is the price at which an article has been sold - It is abbreviated as S.P.

Note: Selling price can also be written as SP only.

Profit or Gain

If the selling price of an article is more than the cost price, then there is a gain or profit.

Thus, Profit or Gain = S.P. – C.P.

Loss

If the cost price of an article is greater than the selling price, then the seller suffers a loss.

Thus, Loss = C.P. – S.P.

Profit and loss are always calculated with the respect to the cost price of the item

$$\text{Profit\%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

$$\text{Loss\%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$$

Example:

By selling an article at 500 Rs. Mohan incurs 50 Rs. gain then find cost price of that article

C.P. = SP – Gain

C.P. = 500 – 50

= Rs. 450

Example:

Ramesh purchased a radioset at Rs. 1500 and sold it at Rs. 1200. Find loss incurred by him?

Loss= C.P. – SP

= 1500 – 1200 = 300.

Also in this case we can calculate

$$\text{Loss\%} = \frac{300}{1500} \times 100 = 20\%$$

Thus he incurred 20% loss.

Basic Formulae

1. When SP and Gain% are Given then

$$\text{CP} = \left(\frac{100}{100 + \text{Gain\%}}\right) \times \text{S.P.}$$

2. When the C.P. and Gain % are given then

$$\text{S.P.} = \frac{100 + \text{Gain\%}}{100} \times \text{C.P.}$$

3. When C.P. and loss% are given then

$$\text{SP} = \frac{100 - \text{Loss\%}}{100} \times \text{C.P.}$$

4. When S.P. and loss percentages are given

$$CP = \left(\frac{SP}{100 - Loss\%}\right) \times 100$$

5. If the cost price (C.P.) of m articles is equal to selling price of n article, then

$$\% \text{ gain or loss } = \left[\frac{m-n}{n}\right] \times 100$$

If m > n, it is % gain and if m < n, it is % loss

Example: If the S.P. of 12 articles is equal to the cost price of 18 articles, what is profit%?.

Solution:

Here m=18, n=12

$$\text{Profit \% } = \frac{(m-n)}{n} \times 100$$

$$= \frac{18-12}{12} \times 100 = \frac{6}{12} \times 100 = 50\%.$$

Example: If the S. P. of a dozen apple is equal to cost price of 9 apples find gain or loss%?

Solution:

Here m=9, n=12

$$\Rightarrow \left(\frac{m-n}{n}\right) \times 100 = \frac{9-12}{12} \times 100$$

$$= \frac{1}{4} \times 100 = -25\% \text{ (–ve)sign indicates loss.}$$

6. When two different articles are sold at the same S.P., getting gain/loss of x% on the first and gain/loss of y% on the second, the overall % gain or % loss in the transaction is given by

$$\left[\frac{100(x+y)+2xy}{(100+x)+(100+y)}\right]\%$$

The above expression represent overall gain or loss according to its given (+)ve or (–ve).

7. When two different articles are sold at the same selling price getting gain of x% on the first and loss of x% on the second, then there will always be loss on such transaction. The overall loss % in such transaction is given by $\left(\frac{x}{10}\right)^2$ %

Example: Michael sold two T.V. sets for Rs. 3600 each gaining 20% on one and loosing 20% on the other. Find the total gain or loss percent.

Solution:

There will always be loss on such transaction

Here $x = 20$

So, overall loss = $\left(\frac{x}{10}\right)^2 \% = \left(\frac{20}{10}\right)^2 \% = 4\%$.

8. A merchant uses faulty measure and sells his goods at gain/loss of x%. The overall % gain or loss (g) is given by

$$\frac{100+g}{100+x} = \frac{\text{True measure}}{\text{Faulty measure}}$$

Note: If merchant sells his goods at cost price then $x = 0$.

Example: A dishonest shopkeeper professes to sell his goods at the cost price but use faulty measure. His 1 kg weight measures 950 gms only. Find his gain percent.

Solution:

Here, True measure= 1000 gms

False measure = 950 gms

Since the Shopkeeper sells the goods at cost price.

$\therefore \quad x = 0,$

$\therefore$ overall gain % is given by

$$\frac{\text{True measure}}{\text{Faulty measure}} = \frac{100+g}{100+x}$$

$$\Rightarrow \quad \frac{1000}{950} = \frac{1000 \times g}{950}$$

So, $100 + g = \frac{1000 \times 100}{950}$, $g = 5\frac{5}{19}\%$.

Note: If g is (–)ve then shopkeeper incurs loss.

Discounts

9. If two successive discount of an article are m% and n% respectively, then a single discount equivalent to the two successive discounts will be

$$\left(m + n - \frac{mn}{100}\right)\%$$

It can also be calculated as

$$\left[100 - 100 \times \frac{(100-m)}{100} \times \frac{(100-n)}{100}\right]\%$$

Ex.1. Two successive discounts of 10% and 20% is equivalent to a single discount of

$$\left(10+20-\frac{10\times 20}{100}\right)=28\%$$

Which is less than 30%.

Ex.2 Find the single discount which is equivalent to a successive discounts of 50% and 40%.

Sol.: Single discount will be equal to

$$\left(m+n-\frac{mn}{100}\right)\%$$

$$\Rightarrow \quad \left(50+40-\frac{50\times 40}{100}\right)\%$$

$$\Rightarrow \quad 70\%$$

Ex.3 Find the single discount which is equivalent to three successive discounts of 10%, 20% and 30%.

Sol.: Here first of all we will determine the single discount, which is equivalent to two successive discounts of 10% and 20%.

$$\Rightarrow \quad \left[10+20-\frac{10\times 20}{100}\right]\%$$

$$\Rightarrow \quad 28\%$$

Now, we will find a single discount which is equivalent to two successive discounts of 28% and 30%

$$\Rightarrow \quad \left[28+30-\frac{28\times 30}{100}\right]\%$$

$$\Rightarrow \quad 49.6\% \text{ Ans.}$$

Ex.4 Find a single discount which is equivalent to three successive discounts of 50%, 40% and 20%.

Sol.: Single Discount equivalent to two successive discounts of 50% and 40% is equal to

$$\Rightarrow \quad \left[50+40-\frac{50\times 40}{100}\right]\%$$

$$\Rightarrow \quad 70\%$$

Now, we will find single discount which is equivalent to two successive discounts of 70% & 20%.

$$\Rightarrow \quad \left[70+20-\frac{70\times 20}{100}\right]\%$$

$$\Rightarrow \quad 76\%$$

Ex.5 Find a single discount which is equivalent to three successive discounts of 20%, 30% and 20%.

Sol.: Single discount equivalent to 20% and 30% is

$$\Rightarrow \quad \left[20+30-\frac{20\times 30}{100}\right]\%$$

$$\Rightarrow \quad 44\%$$

Now, we will find single discount which is equivalent to two successive discounts of 44% and 20%.

$$\Rightarrow \quad \left[44+20-\frac{44\times 20}{100}\right]\%$$

$$\Rightarrow \quad 55.2\%$$

□□□□

Solved Examples

1. By selling a watch for Rs. 495, a shopkeeper incurs a loss of 10%. Find the cost price of the watch for the shopkeeper.

(a) Rs. 545 (b) Rs. 550
(c) Rs. 555 (d) None of these

Ans. (b)

Here S.P.=495

Loss = 10%

$$\text{C.P.}=\frac{\text{SP}}{(100-\text{Loss}\%)}\times 100$$

$$\text{CP}=\frac{495}{90}\times 100=\text{Rs. } 550$$

2. By selling a cap for Rs. 34.40, a man gains 7.5% percent. What will be the CP of the cap?

(a) Rs. 32.80 (b) Rs. 32
(c) Rs. 32.40 (d) Rs. 28.80

Ans. (b)

$$\text{C.P.}=\frac{\text{SP}}{(100+\text{Gain}\%)}\times 100$$

$$\Rightarrow \quad \frac{34.40}{107.5}\times 100=32$$

3. A shopkeeper sold goods for Rs. 2400 and made a profit of 25% in the process. Find his profit percent if he had sold his goods for Rs. 2040.

(a) 6.25% (b) 7%
(c) 6.20% (d) 6.5%

Ans. (a)

SP = 2400, Profit% = 25

$$C.P. = \frac{SP}{(100+P\%)} \times 100 = \frac{2400}{125} \times 100 = 1920$$

If sold at 2040, profit = Rs. 120

$$\text{Profit \%} \Rightarrow \frac{120}{1920} \times 100 = 6.25$$

4. A digital diary is sold for Rs. 935 at a profit of 10%. What would have been the actual profit or loss on it, if it had been sold for Rs. 810?

(a) Rs. 45 (b) Rs. 40

(c) Rs. 48 (d) Rs. 50

Ans. (b)

SP = 935, Profit %= 10%

$$CP = \frac{935}{110} \times 100 = 850$$

Diary if sold at 810 incurs loss of Rs. 40

5. By selling bouquets for Rs. 63, a florist gains 5%. At what price should he sell the bouquets to gain 10% on the cost price?

(a) Rs. 66 (b) Rs. 69

(c) Rs. 72 (d) Rs. 72.50

Ans. (a)

SP = 63, Profit % = 5

$$CP = \frac{63}{105} \times 100 = \text{Rs. } 60$$

Thus, to gain 10% it should be sold at 66 Rs.

6. A shopkeeper bought 240 chocolates at Rs. 9 per dozen. If he sold all of them at Re. 1 each, what was his profit percent?

(a) 66(1/6)% (b) 33(1/3)%

(c) 24% (d) 27%

Ans. (b)

CP of 12 chocolate = Rs. 9

$$\text{CP of 1 chocolate} = \frac{9}{12} = \text{Rs. } 0.75$$

Now SP = Re. 1 Proift = Rs. 0.25

$$\text{Profit \%} = \frac{0.25}{0.75} \times 100 = 33\frac{1}{3}\%$$

7. A coal merchant makes a profit of 20% by selling coal at Rs. 25 per quintal. If he sells the coal at Rs. 22.50 per quintal, what is his profit percent on the whole investment?

(a) 6% (b) 6.66%

(c) 7.5% (d) 8%

Ans. (d)

Profit % = 20%, SP=25

$$CP = \frac{25}{120} \times 100 = \frac{125}{6} \text{ Rs.} = 20.83$$

Profit if SP = 22.50 = 22.50 – 20.83 = 1.667

$$\text{Profit \%} = \frac{1.667}{20.83} \times 100 = 8\%$$

[in fractional term this can be solved very easily]

8. The cost price of a shirt and trouser is Rs. 371. If the shirt costs 12% more than the trousers, find the cost price of the trouser.

(a) Rs. 125 (b) Rs. 150

(c) Rs. 175 (d) Rs. 200

Ans. (c)

Let CP of trouser be Rs. x

$$\text{Now CP of shirt} = \frac{112x}{100} \text{ Rs.}$$

According to given condition $x + \frac{112x}{100} = 371$,

$$\frac{212}{100}x = 371,$$

x = Rs. 175

9. A pet shop owner sells two puppies at the same price. On one he makes a profit of 20% and on the other he suffers a loss of 20%. Find his loss or gain percent on the whole transaction.

(a) Gain of 4% (b) No profit no loss

(c) Loss of 10% (d) Loss of 4%

Ans. (d)

In such cases he always incurs loss and loss percentage

$$= \left[\frac{x}{10}\right]^2 = \left(\frac{20}{10}\right)^2 = 4\%$$

10. The marked price of a table is Rs. 1200, which is 20% above the cost price. It is sold at a discount of 10% on the marked price. Find the profit percent.

(a) 10% (b) 8%

(c) 7.5% (d) 6%

Ans. (b)

MP = 1200

$$C.P. = \frac{1200}{120} \times 100 = 1000$$