3. Tommy is planning for his future after his S.6 graduation. He has several options and his order of preference is as follows.

First option:	Being a barista in a café
Second option:	Being a trainee in digital marketing
Third option:	Being a junior fireman

Which of the following factors would **LEAST** likely affect the cost-benefit analysis for Tommy's career choice?

A. Coffee culture becomes more popular.
B. More companies expand their digital marketing departments.
C. The remuneration of junior firemen worsens.
D. Safety measures of fire-fighting are improved drastically.

7. The following table shows the input, output and cost relationships of a firm. The only inputs required for production are labour and capital.

Labour (units)	Capital (units)	Total product (units)	Total cost of production
1	1	20	$150
2	1	50	$200
3	1	70	$250
4	1	80	$300

Based on the above table, we can conclude that

A. the firm enjoys economies of scale.
B. the optimal scale of production is 70 units.
C. the average product of labour is at the highest when the quantity of labour is 2 units.
D. the law of diminishing marginal returns does not apply to the firm.

11. Winnie operates a café in Sham Shui Po. To maximise her profit, Winnie will produce more output if

A. water charges for commercial use fall.
B. business registration fee falls.
C. the monthly rental payment of the café rises.
D. the wage rate of part-time waiters increases.

1. (a) Mary was the major shareholder of a private limited company which operated a restaurant chain. She planned to change the form of business ownership to a listed company. List **ONE** advantage and **ONE** disadvantage of the change.
(2 marks)

(b) After opening some new restaurants, Mary found that the average cost of production of her company had increased. Explain the change in average cost with **ONE** reason.
(2 marks)

SECTION 3: INPUT-OUTPUT RELATIONSHIP

3.1 THE LAW OF DIMINISHING RETURNS

Multiple Choice Questions

1990/CE/II/06

No. of Workers	Marginal Output
1	10
2	12
3	14
4	13
5	12

From the above table, the average output will be the highest when _____ workers are employed.

    A.   2
    B.   3
    C.   4
    D.   5

1992/CE/II/17
Suppose labour is the only variable factor in producing Good X. The daily total product of X is shown below:

Number of Workers	Total Product (units)
1	10
2	23
3	42
4	62
5	80

Diminishing marginal returns will set in after _____ workers are employed

    A.   2
    B.   3
    C.   4
    D.   5

1994/CE/II/21
The law of diminishing returns

    A.   **states that firms will keep on adding variable** factors to fixed factors
    B.   **implies that firms will eventually operate at a** loss.
    C.   implies that marginal product can be negative
    D.   explains production in the long run.

1996/CE/II/22

Short run is a period in which

    (1)   there are fixed factors of production.
    (2)   there are variable factors of production.
    (3)   the technology of production is fixed.

    A.   (1) and (2) only
    B.   (1) and (3) only
    C.   (2) and (3) only
    D.   (1), (2) and (3)

1996/CE/II/23

No. of workers	1	2	3	4
Average product (units)	2	6	7	4

Refer to the above table. Diminishing marginal return sets in after _____ workers are employed in the production.

    A.   1
    B.   2
    C.   3
    D.   4

1999/CE/II/15

No. of workers	Marginal Output (Units)
1	10
2	12
3	11
4	10
5	7

From the above table, the average output will start to diminish when the _____ worker is put to work.

    A.   first
    B.   second
    C.   third
    D.   fourth

2002/CE/II/13

The following table shows the monthly production of a firm with two inputs, labour and machines.

Machines (Units)	Labour (Units)	Total Product (Units)
1	3	18
1	4	28
1	5	40
1	6	50
1	7	X

If the law of diminishing marginal returns applies to the firm, X

    A.   must be smaller than 50.
    B.   can be any value greater than 50.
    C.   must be smaller than 60.
    D.   is equal to 60.

2003/CE/II/20

The information below refers to Mr Chan's factory.

No. of workers	Average Output (Units)
10	5
11	6
12	7

Suppose diminishing marginal return sets in when more than 12 workers take part in production. The total output of 13 workers

    A.   can be greater than 102 units.
    B.   may be equal to 102 units.
    C.   must be less than 102 units.
    D.   is indeterminate.

2004/CE/II/18

The input-output relationship of Firm A is as follows:

Labour (Units)	Machinery (Units)	Average Output of Machinery (Units)
4	1	6
4	2	7
4	3	8
4	4	7
4	5	5

According to the above table, diminishing marginal returns set in when the ___ unit of machinery is employed.

    A. 2nd
    B. 3rd
    C. 4th
    D. 5th

2006/CE/II/17

The input-output relationship of Firm A is as follows:

Labour (Units)	Machine (Units)	Marginal Product of Labour (Units)
1	2	14
2	2	16
3	2	18
4	2	X

Diminishing marginal returns set in after the 3rd unit of labour is employed. The average product of 4 units of labour can be _____ units of output.

    A.   16
    B.   16.5
    C.   17
    D.   17.5

2008/CE/II/16

The input-output relationship of a firm is as follows:

Labour (units)	Machinery (units)	Average product of labour (units)
1	2	14
2	2	15
3	2	16

Diminishing marginal returns set in after the 3rd unit of labour is employed. The marginal product of the 4th unit of labour must be any number of output smaller than _____ units.

A. 15
B. 16
C. 17
D. 18

2010/CE/II/19

The input-output relationship of a firm is as follows:

Machine (units)	Labour (units)	Average product of labour (units)
3	1	20
3	2	12
3	3	11
3	4	10

According to the above table, diminishing marginal returns set in after _____ unit(s) of labour is/are employed.

A. 1
B. 2
C. 3
D. 4

2014/DSE/I/05

The following table shows a production plan of a firm which employs two factors only, namely labour and machinery.

Labour (unit)	Machinery (unit)	Total Product (unit)
1	4	100
2	4	120
3	4	150
4	4	170
5	4	165

The marginal product of labour will start to diminish when the _____ unit of labour is put to work.

A. second
B. third
C. fourth
D. fifth

2015/DSE/I/09

The table below shows the total product of Firm A, which employs only capital and labour in production.

Labour (units)	Capital (units)	Total Product (units)
12	2	110
12	3	130
12	4	160
12	5	X

Which of the following statements about Firm A is correct?

A. If the above data illustrate the law of diminishing marginal return, the value of X can be equal to 180.
B. If the above data illustrate the law of diminishing marginal return, the value of X can be equal to 190.
C. If the above data illustrate the law of diminishing marginal return, the value of X can be larger than 200.
D. The law of diminishing marginal return does not apply to Firm A because capital is not a fixed factor.

2018/DSE/I/10

The following table shows the input-output relationship of a firm. The only inputs required are capital and labour.

Capital (units)	Labour (units)	Marginal product of labour (units)
2	1	5
2	2	7
2	3	9
2	4	8
2	5	6

The average product of labour is at the highest when the quantity of labour is _____ units.

A. 2
B. 3
C. 4
D. 5

Short & Structured Questions

1994/CE/I/11(a)
Mr Chan owns a farm. The following table shows the input-output relationship of this farm.

Fertilizers (Units)	Land (Units)	Labour (Units)	Total Output of Vegetables (Units)
0	10	40	30
1	10	40	70
2	10	40	120
3	10	40	160
4	10	40	190

State the law of diminishing returns and explain whether this law applies to Mr Chan's farm.   (6 marks)

1997/CE/I/3
The following table shows the fall in total output of a factory when there are sick workers who cannot come to work.

No. of sick workers absent from work	Decrease in daily output (units)
1	20
2	50
3	90
4	140
5	200

Use the above data to illustrate the law of diminishing marginal returns.   (5 marks)

1998/CE/I/4
The following table shows the weekly production of a garment factory with only two factors of production

No. of Machines	No. of Workers	Total Product (Units)
1	2	20
2	3	28
3	4	31
4	5	31
5	6	30

(a)   State the law of diminishing marginal returns.   (4 marks)

(b)   Explain whether the above data illustrate the law of diminishing marginal returns.   (2 marks)

2000/CE/I/4
The table below shows the production of a firm.

Machinery (units)	Labour (units)	Average output of labour (units)
10	7	30
10	8	34
10	9	37
10	10	39
10	11	40

State the law of diminishing marginal returns and explain whether the above data illustrate the law.   (6 marks)

2001/CE/I/3
The table below shows the production of a firm.

Labour (Units)	Machinery (Units)	Total Product (Units)
10	5	100
11	5	150
12	5	250
13	5	400
14	5	530

Explain which law in economics can be illustrated by the above data.   (7 marks)

2003/CE/I/2
(a)   State the law of diminishing marginal returns.   (3 marks)

(b)   The following table shows the input-output relationship of a firm. Explain why the table illustrates the law in (a).

Machine (Unit)	Labour (Unit)	Average output of machine (Unit)
1	3	12
2	3	13
3	3	14
4	3	13

     (3 marks)

2006/CE/I/4
The table below shows the input-output relationship of a firm.

Labour (Units)	Machine (Units)	Total output of labour (Units)
2	3	40
3	3	90
4	3	150
5	3	180
6	3	200

State the law of diminishing marginal returns and explain whether the above data illustrate the law.   (6 marks)

2007/CE/I/3
(a)   State the law of diminishing marginal returns.   (3 marks)

(b)   Study the following information on a factory.

Machines (units)	Labour (units)	Average product (units)
1	5	40
1	6	70
1	7	90
1	8	100

Explain whether the above data illustrate the law of diminishing marginal returns.   (4 marks)

2009/CE/I/3

The table below shows the input-output relationship of a firm.

Labour (Units)	Machine (Units)	Average output of labour (Units)
1	2	10
2	2	12
3	2	14
4	2	16
5	2	17

State the law of diminishing marginal returns and explain whether the above data illustrate the law. (6 marks)

2012/DSE/II/2

The table below shows the input-output relationship of a firm.

Workers (units)	Machine (units)	Total output (units)
10	1	10
15	2	23
20	3	42
25	4	62
30	5	80

State the law of diminishing marginal returns and explain whether the above data illustrate the law. (5 marks)

2016/DSE/II/3

The table below shows the input-output relationship of a firm .

Machine (units)	Labour (units)	Average output of labour (units)
2	1	10
2	2	12
2	3	14
2	4	14
2	5	13

State the law of diminishing marginal returns and explain whether the above data illustrate the law. (6 marks)

2021/DSE/II/1c

The following is the advertisement of an online food delivery firm for recruiting riders.

Riders Wanted !!!	
Earn great money	**Bring your own equipment**
• High salary for each delivery!	• A smartphone
• Keep 100% tips from customers	• A motorcycle with the necessary safety equipment

(c) After employing more riders, the firm found that its system was overloaded and the marginal product of riders dropped. State the law that explains this phenomenon and briefly explain why such law can be applied in this case. (5 marks)

MARKING SCHEME

1990/CE/II/06 C	1996/CE/II/22 D	2002/CE/II/13 C (58%)	2006/CE/II/17 A (58%)	2014/DSE/I/05 C (79%)
1992/CE/II/17 C	1996/CE/II/23 B	2003/CE/II/20 C (62%)	2008/CE/II/16 D (53%)	2015/DSE/I/09 A (79%)
1994/CE/II/21 C	1999/CE/II/15 D	2004/CE/II/18 C (69%)	2010/CE/II/19 C (44%)	2018/DSE/I/10 C (65%)

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.

1994/CE/I/11(a)

Law of diminishing returns:
When variable factors are added continuously to the fixed factors, the marginal product will eventually diminish. (3)

Fertilizers (Units)	Land (Units)	Labour (Units)	TP (Units)	MP (Units)
0	10	40	30	-
1	10	40	70	40
2	10	40	120	50
3	10	40	160	40
4	10	40	190	30

From the above table, after 2 units of the variable factor (fertilizers) are employed, an additional unit of fertilizers leads to a fall in MP ⇒ the law applies to the farm. (3)

1997/CE/I/3

Assume that the factory has 100 workers. (The number is arbitrary.) After 95 workers are employed, the change in MP caused by adding more and more workers in production can be found by converting the table given in the question into the following table:

No. of workers coming to work	MP (units / day)
95	-
96	60
97	50
98	40
99	30
100	20

(2)

In other words, when the variable factor (labour) is continuously added to the fixed factors (land, capital and entrepreneurship), the marginal product will eventually diminish. This is the law of diminishing marginal returns. (3)

1998/CE/I/4

(a) When a variable factor is successively added to the fixed factor(s), (holding technology constant) (2)
the marginal product will eventually diminish. (2)

(b) No, because (2)
all factors are variable / long-run production.

2000/CE/I/4

The law states that when variable factors are added continuously to the fixed factors, (holding technology constant), the marginal product will eventually decrease. (3)

The marginal product calculated is shown below: (3)

AP	MP
30	-
34	62
37	61
39	57
40	50

∴ The data illustrate the law of D.M.P.

2001/CE/I/3

(The data show that) machinery is a fixed factor and (1)
when the variable factor, labour, is added successively to machinery, (1)
the marginal product eventually diminishes (2)

Labour (units)	Machinery (units)	MP (units)
10	5	-
11	5	50
12	5	100
13	5	150
14	5	130

(2)

∴ the data illustrate the law of diminishing marginal returns. (1)

2003/CE/I/2

(a) The law states that as the variable factor is continuously added to the fixed factor, the marginal product will eventually diminish. (3)

(b)

Machine (Unit)	MP (Unit)
1	-
2	14
3	16
4	10

It illustrates the law in (a) since MP eventually diminishes from 16 units of output to 10 units of output when the 4th unit of machine is added to the production. (3)

2006/CE/I/4

The law states that when variable factors are added continuously to the fixed factors, [holding technology constant,] the marginal product will eventually decrease. (3)

Labour (Units)	4	5	6
Marginal Product (Units)	60	30	20

(2)

OR
Diminishing marginal product of labour sets in when labour increases from 4 units to 5 units as the marginal product falls from 60 to 30 units. (2)

∴ The data illustrate the law of diminishing marginal returns. (1)
2007/CE/I/3

(a) The law states that when variable factors are added continuously to the fixed factors, the marginal product will eventually decrease. (3)

(b)

Labour (units)	Marginal product (units)
5	-
6	220
7	210
8	170

(2)

Yes, because (1)
the marginal product decreases. (1)

2009/CE/I/3

The law states that when variable factors are added continuously to the fixed factors, the marginal product will eventually decrease. (3)

Machine (units)	Marginal output of labour (units)
3	18
4	22
5	21

(2)

Yes, because (1)
the marginal product decreases.

2012/DSE/II/2

The law states that (holding technology constant,) when more units of a variable factor are added successively to a given quantity of fixed factors, the marginal product of this factor will eventually diminish. (3)

No, because (1)
there is no fixed factor / long-run production. (1)

2016/DSE/II/3

The law states that (holding technology constant) when more units of a variable factor are added successively to a given quantity of fixed factors, the marginal products of this factor will eventually diminish. (3)

Yes, because (1)
when labour increases from 3 to 4 units, the marginal product of labour drops from 18 to 14 units (, so the law of diminishing returns holds). (2)

2021/DSE/II/1c

The law of diminishing marginal returns states that when more units of variable factors are added continuously to a given quantity of fixed factors, the marginal products will eventually diminish, ceteris paribus.
The system is fixed factor of the firm, when more units of labour (variable factor) is added to the given quantity of fixed factor, the system was overloaded, so it cannot increase the marginal product.

3.2 VARIABLE AND FIXED COSTS

Multiple Choice Questions

1990/CE/II/11
Which of the following is regarded as a fixed cost of a restaurant?

    A.   the water charges
    B.   the wages of the part-time workers
    C.   the expenditure on meat and vegetables
    D.   the rent of the restaurant

2003/CE/II/10
Suppose the MTR extends its service hours on New Year's Eve. Which of the following are the MTR's variable costs of extending the service hours?

    (1)   electricity expense
    (2)   overtime payment to the drivers
    (3)   interest payment for loans from banks

    A.   (1) and (2) only
    B.   (1) and (3) only
    C.   (2) and (3) only
    D.   (1), (2) and (3)

2017/DSE/I/10
An art centre extends its business hours for one hour in order to offer more painting classes. Which of the following are variable costs involved in the extra hour of operation?

    (1)   salary of the accountant
    (2)   electricity fee
    (3)   expense on paints '
    (4)   rental payment

    A.   (1) and (4) only
    B.   (2) and (3) only
    C.   (1), (2) and (4) only
    D.   (1), (2), (3) and (4)

Short & Structured Questions

1991/CE/I/4(a)(ii)
Mr. Chan was a lorry driver of a construction company. Last year, he left the company and began to work on his own with his lorry, taking orders directly from customers.

Suggest **ONE** fixed cost and **ONE** variable cost in the above production process. Explain your answer.   (6 marks)

2014/DSE/II/2(b)
Ah Wing runs a store selling mobile phone accessories in Mong Kok. Give **ONE** example of variable cost incurred in Ah Wing's business. Explain your answer.   (2 marks)

MARKING SCHEME

1990/CE/II/11	2003/CE/II/10	2017/DSE/I/10
D	A (90%)	B (87%)

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.

1991/CE/I/4(a)(ii)
License fee of the lorry / monthly parking fee of the lorry / registration fee of the firm is a fixed cost, because   (1)
  it does not vary with the output level.   (2)

Cost of petroleum / depreciation of the lorry is a variable cost, because   (1)
  it varies with the output level.   (2)

2014/DSE/II/2(b)
Cost of buying the accessories, or wages of part-time workers, because   (1)
  expenses on these items would vary (increase) with the output of Ah Wing's shop.   (1)
[Mark the **FIRST** example only.]

3.3 ECONOMIES & DISECONOMIES OF SCALE

<u>Multiple Choice Questions</u>

1990/CE/II/22

'As the carrying capacity of a bus increases, the oil consumption increases. However, the oil consumption increases at a slower rate than the carrying capacity. This is an example of

- A. external economies of scale
- B. technical economies of scale
- C. management economies of scale
- D. research economies of scale

1991/CE/II/20

The cost per tonne of goods transported by a bigger lorry is lower than that of a smaller one. This is an example of

- A. management economies
- B. marketing economies
- C. financial economies
- D. technical economies

1992/CE/II/20

The Urban Council and Regional Council are responsible for growing young trees for planting around Hong Kong. Each nursery is usually large in size. Furthermore, a large number of the same kind of young trees are planted in the same area of the nursery. This type of nursery has the following advantages:

- (1) economy of scale on irrigation facilities
- (2) economy of scale by caring for plants of the same kind
- (3) economy of scale in purchasing fertilizers

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

1993/CE/II/21

'It is uneconomical to use a jumbo aircraft to carry a small number of passengers.' This can be explained by

- A. the principle of comparative advantage
- B. the law of diminishing returns
- C. technical economies
- D. diseconomies of scale

1995/CE/II/22

Which of the following about economies of scale is true?

- A. It applies to short-run as well as long-run production.
- B. It will lead to a decrease in the average cost of production when the output increases.
- C. It occurs only when scale of production is sufficiently large.
- D. It will lead to a decrease in the total cost of production when the output increases.

1998/CE/II/13

In general, which of the following are the advantages of a small firm over a large firm in the same industry?

- (1) There is a better relationship between the employees and the employer.
- (2) It is more adaptable to changing market situations.
- (3) Specialization can be carried out more extensively.
- (4) More funds can be raised at a lower cost.

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (4) only
- D. (3) and (4) only

2000/CE/II/17

Which of the following implies the existence of economies of scale?

- A. The total cost of production decreases when output increases.
- B. The average cost of production decreases when the production scale increases.
- C. Profit increases when output increases.
- D. The amount of output increases by a smaller proportion than that of inputs.

2004/CE/II/20

Compared with small stores, large supermarkets purchase a large stock of goods from suppliers at a lower average cost. It shows that these large supermarkets enjoy _____ economies of scale.

- A. finance
- B. management
- C. technical
- D. marketing

2005/CE/II/18

When a firm enjoys economies of scale, it is in the _____ and its _____ is decreasing.

- A. short run ...... average cost
- B. long run ...... average cost
- C. short run ...... total cost
- D. long run ...... total cost

2006/CE/II/18

If large publishers are more able to fully utilize their machinery to lower the average cost than small publishers, then these large publishers enjoy _____ economies of scale.

- A. financial
- B. management
- C. marketing
- D. technical

2008/CE/II/17

Compared with local small accounting firms, large accounting firms in Hong Kong are more willing to use resources to familiarize themselves with China's laws in order to expand their business into Mainland China. One possible reason is that large accounting firms enjoy

- A. financial economies of scale.
- B. technical economies of scale.
- C. marketing economies of scale.
- D. economies of scale in research and development.

2013/DSE/I/05

In order to increase the number of nurses for expanding medical services, the government has allocated more resources to expand the nursing programme in universities. In this case, private hospitals will

- A. enjoy internal economies of scale.
- B. suffer internal diseconomies of scale.
- C. enjoy external economies of scale.
- D. suffer external diseconomies of scale.

2016/DSE/I/07

A school is a production unit which provides educational services. The following are people and objects that are usually found at a school:

- (1) the school building
- (2) teachers
- (3) students
- (4) private cars owned by teachers
- (5) sanitisers (洗手液) in the toilets

In the long run, which of the above items are variable factors of production of the school?

- A. (1) and (5) only
- B. (1), (2) and (5) only
- C. (2), (3) and (4) only
- D. (1), (2), (3), (4) and (5)

2018/DSE/I/12

Which of the following statements about economies of scale is correct?

- A. It could be a source of monopoly power.
- B. It exists when the average fixed cost is falling.
- C. Only large firms enjoy economies of scale.
- D. It is the result of the law of diminishing marginal returns.

2020/DSE/I/7

Tai On Building (太安樓) in eastern Hong Kong Island is well-known as a 'foodie paradise'. A variety of street snacks such as cart noodles, egg waffles, dumplings and mango mochi are sold by numerous small vendors. Customers from different districts fill their stomaches at Tai On Building.

Based on the above information, street snack vendors at Tai On Building can _____.

- A. enjoy internal economies of scale
- B. enjoy external economies of scale
- C. suffer internal diseconomies of scale
- D. suffer external diseconomies of scale

Short & Structured Questions

1992/CE/I/1(b)

Suggest **TWO** reasons why it can be more advantageous to run a large taxi company with many taxis rather than a small taxi company with only one taxi. (6 marks)

1993/CE/I/1(c)

Yummy Yummy is a fast food shop.
(i) Last year, 'Yummy Yummy' planned to establish a branch. Explain whether this was a short-run or long-run plan. (2 marks)

(ii) After the opening of this branch, the unit cost of producing hamburgers is lower. Give **TWO** economic reasons for this. (6 marks)

1995/CE/I/10(a)(ii)
Study the following piece of news reported in the USA

> A local singer has volunteered to perform two identical shows and the sales receipt of the concert tickets will be donated to the Rwanda refugees in Africa for their food and medical supply expenses ......

Explain **TWO** economies of scale that may arise from holding two identical shows instead of only one show. (4 marks)

1997/CE/I/9(a)

Suppose the government builds a railway in northwest New Territories.

If the new railway is to be run by the Kowloon-Canton Railway Corporation (KCRC), give **TWO** reasons why this can bring down the average cost of KCRC. (4 marks)

2000/CE/I/10(b)(i)

Suppose Bank X of economy A takes over Bank Y of economy B by buying up its controlling share worth $5 million. Explain what type of expansion the takeover belongs to and explain **THREE** economies of scale that may arise from the takeover. (8 marks)

2004/CE/I/11(c)(i)

A famous chain of fashion stores opens a new branch.
Explain **TWO** economies of scale that the chain stores might enjoy due to the expansion. (4 marks)

2007/CE/I/1

It is expected that the average cost of providing the railway service will decrease after the integration of the Mass Transit Railway Corporation Limited (MTRC) and the Kowloon-Canton Railway Corporation (KCRC).
Give **THREE** reasons to explain why such integration could reduce the average cost. (6 marks)

2009/CE/I/9(a)

In recent years, the price of textbooks has become a public concern.
Textbook publishers usually print textbooks in large amounts in order to reduce their average cost of production.
Explain **TWO** economies of scale that a firm may enjoy when it expands its production scale. (4 marks)

2010/CE/I/9(a)

Ocean Park Hong Kong is undergoing a major redevelopment plan.
Ocean Park will expand to double the number of its attractions. Explain **TWO** economies of scale that it may enjoy after expansion. (4 marks)

2015/DSE/II/2(b)

Many electronic product retailers are located in Mong Kok.

Suggest **TWO** reasons why an electronic product retailer in Mong Kok may enjoy external economies of scale. (4 marks)

2016/DSE/II/2(c)

The average cost of providing the services decreases when the Group operates more tutorial classes in different districts. Give **THREE** reasons to explain why its average cost decreases. (3 marks)

2017/DSE/II/2(b)

Due to the opening of several new branches, the average cost of production of the restaurant has increased. Explain with **TWO** reasons why this happens. (4 marks)

2018/DSE/II/3

Shenzhen has become China's 'Silicon Valley'. The headquarters of many high technology firms such as Tencent (騰訊), Huawei (華為) and BYD (比亞迪) are located there. Explain **TWO** external economies of scale high technology firms may enjoy in Shenzhen. (4 marks)

2020/DSE/II/2

(c) After the opening of 10 more restaurants, the firm found that its average cost decreased. State **TWO** possible reasons for this. (2 marks)

MARKING SCHEME

1990/CE/II/22	1993/CE/II/21	2000/CE/II/17	2006/CE/II/18	
B	C	B	D (72%)	2016/DSE/I/07
				B (52%)
1991/CE/II/20	1995/CE/II/22	2004/CE/II/20	2008/CE/II/17	
D	B	D (63%)	D (38%)	2018/DSE/I/12
				A (51%)
1992/CE/II/20	1998/CE/II/13	2005/CE/II/18	2013/DSE/I/05	
D	A	B (58%)	C (71%)	2020/DSE/I/7
				B

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.

1992/CE/I/1(b)

It enjoys economies of scale (1)
- purchasing economy: bulk purchase of spare parts at a discount
- financial economy: lower cost of borrowing due to goodwill / sufficient collateral
- technical economy: fully utilize machines and spare parts (i.e. less than proportionate of part and components are kept for maintenance purpose) (3@, max: 6)

[Mere listing of points without elaboration – max. 2 marks. Mark the **FIRST TWO** points only.]

1993/CE/I/1(c)

(i) Long run, because
all factors are variable / the scale of production is enlarged because the employment of all factors is increased. (2)

(ii) - economics of scale (without explanation) (1)
- management economy: increased productivity due to greater scope of specialization (3)
- technical economy: fully utilize machines e.g. a van for delivery service (3)
- purchasing economy: bulk purchase of food materials at a greater discount (3)
(max: 6)

[Mere listing of points without elaboration – max: 2 marks. Mark the **FIRST TWO** points only.]

1995/CE/I/10(a)(ii)

- the set up cost required for two shows is the same as that for one (2)
- management economies: the expertise required for two shows is the same as that for one (i.e. the payment to such professionals as designers and accountants can be spread over a larger output.) (2)
- marketing economies: the advertising fee for marketing two shows is the same as that for one (i.e. the advertising fee can be spread over a larger output.) (2)
- purchasing economies: purchase of materials required at a bigger discount than that for one show (2)
(2@, max:4)

[Mark the **FIRST TWO** points only.]

1997/CE/I/9(a)

Elaboration of the following points in relation to KCRC:
- technical economies: fully utilize plants and equipment, such as maintenance depots
- financial economies of scale: borrow at a lower interest rate due to more collaterals
- managerial economies of scale: increased productivity due to greater scope of specialization
- purchasing economies of scale: bulk purchase of new trains, parts and consumables, etc. at a greater discount
- research and development economies: spreading R&D cost over a larger output (2@, max: 4)
[Mark the **FIRST TWO** points only.]
[Remark : Mere mention of the term 'economies of scale' without elaboration – max: 1 mark.]

2000/CE/I/10(b)(i)

Horizontal integration, because (1)
  they are doing the same or similar businesses (1)

Elaboration of 3 of the following:
- financial economies of scale: borrow at a lower interest rate due to more collaterals
- managerial economies of scale: increased productivity due to greater scope of specialization
- purchasing economies of scale: bulk purchase of stationary, printing service (leaflet), etc. at a greater discount
- research and development economies: spreading R&D cost over a larger output (2@, max: 6)

[Mark the **FIRST THREE** points only.]

2004/CE/I/11(c)(i)

Name 2 relevant economies of scale with elaboration.
- marketing economies of scale: bulk purchase at lower cost, etc
- technical economies of scale: a fuller use of the plants and equipment
- managerial economies of scale: a wider scope for specialization
- financial economies of scale: easier to raise capital and at a lower interest rate (2@, max: 4)

[Remark: Mark the **FIRST TWO** points only.]

2007/CE/I/1

- management: higher productivity due to a greater scope for specialization / due to benefits from management expertise
- technical: fuller use of resources and facilities / elimination of duplication of resources
- financing: more flexible to raise funds / borrow from banks at a lower interest rate
- purchasing: bulk purchase of raw materials with discount
- marketing: can spread the advertising cost over a larger output
- research and development: can spread the R&D cost over a larger output (2@, max: 6)

[Mark the **FIRST THREE** points only.]

2009/CE/I/9(a)

- Technical economies of scale:	Large firms can utilize more fully the machines and plant equipment and thus reduce the average cost.
- Managerial economies of scale:	A large firm with a wider scope of specialization can raise efficiency and reduce the average cost
- Financial economies of scale:	Large firms can obtain capital at a lower cost, e.g , borrow from a bank at a lower interest rate.
- Marketing economies of scale in purchasing materials:	Buying raw materials in bulk helps to obtain discounts in the purchase and results in a decrease in average cost.
- Marketing economies of scale in advertising:	As the advertising cost and the cost of providing extra service to customers spread over a larger output, the average cost also decreases.
- Risk diversification:	Large firms can reduce risk by diversification of markets / sources of raw materials.
- Research and development:	Large firms can afford to do research and development say, for new production techniques, to reduce the average cost.

(2@, max: 4)

[Mark the **FIRST TWO** points only.]

2010/CE/I/9(a)

When the firm is larger in scale, it may enjoy the following economies of scale:

- Financial economies:	Obtaining capital at a lower cost, e.g., borrow from a bank at a lower interest rate.
- Managerial economies:	A wider scope of specialization can raise efficiency and reduce the average cost.
- Technical economies:	When the output is larger, machines can be utilized more fully and efficiently and reduce the average cost.
- Marketing economies of scale in purchasing materials:	Buying raw materials in bulk helps to obtain discounts in the purchase and result in a decrease in average cost.
- Marketing economies of scale in advertising:	Spreading the advertising cost and the cost of providing extra service to customers over a larger output can reduce the average cost.
- Research and development:	Spreading research expenses over a larger output can reduce the average cost.
- Risk bearing:	With more and varied attractions, it can spread risk by diversification of markets / sources of raw materials.

(2@, max: 4)

[Mark the **FIRST TWO** points only.]

2015/DSE/II/2(b)

- reduce cost of marketing and promotion
- reduce transportation cost for suppliers
- more related businesses available such as accessories and repair (2@, max: 4)

[Mark the **FIRST TWO** points only.]

2016/DSE/II/2(c)

- cost of advertising shared by a larger number of students
- bulk purchase of raw material in production
- more extensive division of labour (1@, max: 3)

2017/DSE/II/2(b)

- may have become too large in scale, so managerial efficiency starts declining
- may have large outstanding loans, so the marginal cost (interest rate) of further borrowing increases
- market may have saturated, leading to a rise in the marketing cost (2@, max: 4)

[Mark the **FIRST TWO** points only.]

2018/DSE/II/3

- reduction of marketing and promotion costs, because
  the region would attract more customers for high-technology products/services.
- reduction of transportation cost, because
  transport network and other infrastructures would develop more quickly, thus improving accessibility.
- reduction of average/marginal cost of recruiting more experienced and skilled workers, because
  more of these workers would be attracted to the region. (2@, max: 4)

[Mark the **FIRST TWO** points only.]

2020/DSE/II/2

c Financial economies of scale
  Technical economies of scale
  Marketing economies of scale
  Management economies of scale
  Purchasing economies of scale (2 marks)

3.4 SHORT RUN OR LONG RUN?

Multiple Choice Questions

1994/CE/II/22

A producer increases all his input to double the output. He finds that the total production cost increases by 80%. This can be explained by

    A.   the law of supply.
    B.   the law of diminishing returns.
    C.   economies of scale.
    D.   diseconomies of scale.

1996/CE/II/24

No. of machines	No. of workers	Total output
5	7	100
5	8	120
5	9	150
5	10	200

Refer to the above table. Which of the following is a possible reason for the increase in total output?

    A.   division of labour
    B.   the law of diminishing returns
    C.   the law of comparative advantage
    D.   economies of scale

1997/CE/II/15

During the busy season before Christmas, a factory increases the number of workers to increase output. The result is shown below

No. of workers	Total product (Units)
21	210
22	242
23	276
24	300
25	310

The change in output can be explained by

    A.   the law of diminishing returns.
    B.   diseconomies of scale.
    C.   (out of syllabus)
    D.   (out of syllabus)

2000/CE/II/16

Number of machines	Number of workers	Total output (units)
3	3	90
3	4	160
3	5	250
3	6	360

The above data refer to a _____ situation in which _____.

    A.   short run ...... the law of diminishing returns applies
    B.   short run ...... the law of diminishing returns does not apply
    C.   long run ...... economies of scale exist
    D.   long run ...... diseconomies of scale exist

2001/CE/II/17

The table below shows the production of Good X in a firm. Only two inputs are required in the production process.

Capital (Units)	Labour (Units)	Total Output (units)	Total Cost ($)
1	1	20	100
2	2	35	200
3	3	45	300
4	4	50	400

From the above data,

    A.   the law of diminishing marginal returns applies to the firm.
    B.   the firm enjoys economies of scale.
    C.   diseconomies of scale exist for the firm.
    D.   the firm produces at its optimal scale of production.

2005/CE/II/19

The table below shows the production of Good X in a firm. Only two inputs are required in the production process.

Capital (Units)	Number of Workers	Average working hours of workers per day	Total Output
2	10	10	5 000
2	10	9	4 900
2	10	8	4 700
2	10	7	4 400

Due to a fall in market demand, the firm reduces the output by cutting the working hours of the workers from 10 hours a day to 8 hours a day.

Based on the above information, we can conclude that

    A.   the supply of Good X by the firm decreases.
    B.   the amount of labour employed by the firm remains constant.
    C.   the law of diminishing marginal returns applies to the firm.
    D.   the firm enjoys economies of scale.

2006/CE/II/19

A producer increases all his inputs to double the output. The following table shows the change in average cost after a change in output.

Total Output (Units)	Average Cost ($)
10 000	6
20 000	7

Based on the above information, we can conclude that

A. the firm enjoys economies of scale.
B. the firm suffers from diseconomies of scale.
C. the law of diminishing marginal returns applies to the firm.
D. the firm produces at the optimal scale of production.

2007/CE/II/19

The input-output relationship of Firm A is as follows:

Capital (units)	Labour (units)	Marginal output (units)
1	10	10
1	11	9
1	12	8
1	13	7

From the above table, we can conclude that, as the labour input increases

A. total output is increasing.
B. average output is increasing.
C. firm A is experiencing diseconomies of scale.
D. the average cost of production is decreasing.

2008/CE/II/18

When a firm expands production by only employing more labour,

A. the wage rate of its workers will increase.
B. the average productivity of its workers will increase.
C. the firm will enjoy economies of scale.
D. the marginal product of its workers will eventually decrease.

2009/CE/II/19

Refer to the following information about the inputs, outputs and average cost of a firm. The only inputs required for production are capital and labour.

Capital (units)	Labour (units)	Total output (units)	Average cost ($)
500	5	3 000	3
1 000	10	4 500	4
1 500	15	5 500	5

Within the above range of output, we can conclude that

A. the firm is producing at the optimal scale of production.
B. the law of diminishing marginal returns applies to the firm.
C. the firm does not have a comparative advantage in the production of this good.
D. the firm suffers from diseconomies of scale.

2013/DSE/I/03

The following shows the cost-output relationship of a firm.

Output (units)	0	1	2	3	4	5
Total cost ($)	10	28	42	52	60	72

Based on the above table, we can conclude that

A. the firm enjoys the benefits of economies of scale.
B. the firms optimal scale of production is 5 units of outputs.
C. the average variable cost is increasing.
D. the total fixed cost is $10.

2013/DSE/I/04

Machines (unit)	Labour (unit)	Average Product (unit)
2	3	30
2	4	40
2	5	50
2	6	55

The above table shows a _____ situation in which _____.

A. short run ...... the law of diminishing returns does not apply
B. short run ...... the law of diminishing returns applies
C. long run ..... economies of scale exists
D. long run ...... diseconomies of scale exists

2019/DSE/I/05

The following table shows the production data of a firm. The only inputs required are capital and labour.

Capital (units)	Labour (units)	Total product (units)	Total cost of production ($)
2	2	10	100
3	3	30	270
4	4	45	360
5	5	55	385

Based on the above table, we can conclude that

A. the law of diminishing returns applies to the firm.
B. the total fixed cost is $100.
C. the optimal scale is 45 units.
D. the firm enjoys economies of scale.

2020/DSE/I/8

The following table shows the production plan of a firm which employs two factors only, namely labour and machinery.

Machinery (units)	Labour (units)	Average product of labour (units)
4	1	20
4	2	21
4	3	22
4	4	X

If the above data illustrate the law of diminishing marginal returns, the value of X _____.

A. can be 23
B. can be smaller than 22
C. must be larger than 22
D. must be smaller than 22

Short & Structured Questions

1993/CE/I/1(b)
Yummy Yummy is a fast food shop. With more customers, 'Yummy Yummy' had to employ more workers to increase the output. However, with its existing facilities and equipment, the shop could not further increase the output by employing more workers when the number of workers had reached a certain level.

Name and state the economic law which explains the above situation. (5 marks)

MARKING SCHEME

1994/CE/II/22 C	2000/CE/II/16 B	2006/CE/II/19 B (55%)	2009/CE/II/19 D (66%)	2019/DSE/I/05 D
1996/CE/II/24 A	2001/CE/II/17 C	2007/CE/II/19 A (42%)	2013/DSE/I/03 D (45%)	2020/DSE/I/ D
1997/CE/II/15 A	2005/CE/II/19 C	2008/CE/II/18 D (78%)	2013/DSE/I/04 B (82%)	

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.

1993/CE/I/1(b)
Law of diminishing (marginal) returns (2)
The law states that as more variable factors are added (successively) to the fixed factors, marginal output will (eventually) diminish. (3)

3.5 PROFIT MAXIMISATION

Multiple Choice Questions

1987/AL/I/05
When economists say that a competitive firm faces a perfectly elastic demand curve, they mean

A. the firm will sell an infinite quantity of output at the going price.
B. the law of demand is rejected.
C. all variations in output the firm can make will leave the price unaffected.
D. the good is not a necessity because the quantity demanded will be zero at a higher price.

1987/AL/I/25
Suppose in a price-taking industry, the market price of a product is $6. A firm is producing output at the point where the average total cost equals the marginal cost, both of which are $8. The average variable cost is $5. In order to maximize wealth, the firm will

A. keep on producing but reduce its output.
B. produce zero output.
C. leave its output unchanged.
D. increase its selling price.

1992/AL/I/25
The imposition of a lump-sum tax on each firm in a price-takers' market will

A. decrease the number of firms in the market.
B. increase the output of each firm that remains in business.
C. increase the market price of the output.
D. All of the above.

1995/AL/I/10
Under competitive market equilibrium, all firms will have the same

A. marginal cost of production.
B. total cost of production.
C. profit.
D. level of output

1998/AL/I/29
The demand curve facing a price-taker is perfectly elastic. This implies that

A. the market price will not change.
B. the law of demand cannot be applied in the price-takers' industry.
C. the market price will not decrease even when a seller increases his output.
D. All of the above.

2001/AL/I/29
Which of the following comes closest to a product sold in a price-takers' market?

A. jade
B. gold
C. diamond
D. pearl

2004/AL/I/12

A firm is said to be a price-taker if

    A. it has the same cost curves as other competing firms.
    B. it cannot alone decide on its output level.
    C. it cannot ask a price higher than the market price and expect to survive.
    D. It receives no profit.

2012/DSE/I/09

Refer to the following table showing the production costs of a price-taking firm.

Total Output (units)	Marginal cost ($)	Average variable cost ($)	Fixed cost ($)
2	4	3	1
3	6	4	1
4	8	5	1
5	10	6	1
6	12	7	1

If the product price is $6,

    A. the firm will produce 5 units of output to maximize its profit.
    B. the maximum profit the firm can make is $5.
    C. the average variable cost is $5 when the firm maximizes its profit.
    D. the minimum total cost of the firm is $13.

2014/DSE/I/06

The following table shows the cost-output relationship of a price taker.

Output (units)	Total cost ($)
1	20
2	45
3	75
4	110
5	150

Given that the profit maximizing output of the firm is 3 units. If the fixed cost increases by $5, the price of the good and the output will be _____ and _____ respectively.

    A. $ 25 _____ 2 units
    B. $ 30 _____ 2 units
    C. $ 30 _____ 3 units
    D. $ 75 _____ 3 units

2015/DSE/I/05

The schedule below shows the marginal cost of a firm in a perfectly competitive market.

Output (units)	3	4	5	6	7	8	9
Marginal cost ($)	5	5.5	6	6.5	7	8	9.5

Suppose the rental of the machine hired, a fixed cost, increased by $2 while the marginal cost for each unit of the output is reduced by $0.5. As a result, the profit-maximising output of the firm _____ while the profit of the firm _____.

    A. increases _____ decreases
    B. increases _____ may increase or decrease
    C. decreases _____ decreases
    D. decreases _____ may increase or decrease

2016/DSE/I/12

The following table shows the cost-output relationship of a price-taker.

Output (units)	Average cost ($)
2	20
3	21
4	22
5	23
6	24
7	25

Suppose the market price is $25. What are the profit-maximising output and profit respectively?

    A. 4 units and $0
    B. 4 units and $12
    C 7 units and $0
    D. 7 units and $12

2017/DSE/I/08

The following table shows the cost-output relationship of a price-taker.

Output (units)	Average cost ($)
5	10
6	11
7	12
8	13
9	14

The market price is $20. Suppose the average cost has increased by $2 for every unit of output. The profit of the firm will _____.

    A. increase by $16
    B. increase by $14
    C. decrease by $16
    D. decrease by $14

2018/DSE/I/06

The following table shows the cost-output relationship of a profit-maximising firm. The firm has a fixed cost of $5.

Output (units)	1	2	3	4	5	6
Average cost ($)	7	6	7	8	9.6	12

Which of the following statements is correct?

    A. The optimal scale of production is 2 units.
    B. There exist diseconomies of scale after the third unit of output is produced.
    C. If the market price is $8, the output is 4 units.
    D. If the market price is $9, the profit is $6.

2019/DSE/I/10

The following table shows the cost-output relationship of a price-taking firm.

Total output (units)	Average cost ($)
3	10
4	15
5	20
6	25
7	30

If the profit-maximising output is 6 units, the market price will be _____.

A. $5
B. $25
C. $30
D. $50

2020/DSE/I/9

Refer to the following table about the cost-output relationship of a profit-maximising firm.

Quantity (units)	1	2	3	4	5
Average cost ($)	5	6	7	8	9

If the average cost of every unit of output decreases by $1 and the market price is $8,

A. the minimum cost of production is $18.
B. the profit maximising output is 3 units.
C. the maximum profit is $10.
D. the marginal cost of every unit of output will remain unchanged.

2021/DSE/I/10

Because of the outbreak of COVID-19, the government of a country announced a temporary ban of dine-in services in restaurants. Which of the following statements about restaurants under the temporary ban is correct?

A. If the expected sales revenue generated from takeaway food exceeds the variable cost of running a restaurant, the restaurant will continue to operate.
B. With the extremely high cost of breaking the rental contract, the fixed rental will affect whether the owners continue to operate their restaurant.
C. A decrease in prices of takeaway food will necessarily decrease the sales revenue of the restaurants.
D. Unpopular restaurants will close down before popular ones.

2021/DSE/I/12

The following table shows the cost-output relationship of a price-taking firm.

Quantity (units)	Average cost ($)
1	5
2	4
3	4
4	4.5
5	6

Based on the above table, when the market price falls from $6 to $4, we can conclude that

A. the firm starts to enjoy economies of scale.
B. the total cost of the firm will decrease from $30 to $12.
C. the profit of the firm will decrease by $6.
D. the quantity supplied will decrease from 5 units to 3 units.

Short & Structured Questions

SP/DSE/II/9(c)
Assume the market of electronic watches is perfectly competitive.

Suppose there is an improvement in technology that lowers the marginal cost of producing electronic watches. The schedule below shows the marginal costs of a firm which produces electronic watches before and after the technological improvement.

Output (Units)	Marginal cost ($) *before* the technological improvement	Marginal cost ($) *after* the technological improvement
500	70	60
600	80	70
700	90	80
800	10	90
900	110	10

(i) Is marginal cost a fixed cost or a variable cost? Explain. (2 marks)

(ii) Suppose the market price of electronic watches was $80 before the technological improvement. What is the output of the firm at this market price? (1 mark)

(iii) Suppose the market price of electronic watches fell to $70 after the technological improvement. What is the output of the firm at this market price? (1 mark)

MARKING SCHEME

1987/AL/I/05 C	1995/AL/I/10 A	2004/AL/I/12 C (86%)	2015/DSE/I/05 B (73%)	2018/DSE/I/06 D (42%)
1987/AL/I/25 A	1998/AL/I/29 C	2012/DSE/I/09 B (39%)	2016/DSE/I/12 B (76%)	2019/DSE/I/04 D
1992/AL/I/25 D	2001/AL/I/29 B	2014/DSE/I/06 C (56%)	2017/DSE/I/08 D (55%)	2019/DSE/I/10 D
2020/DSE/I/9 B	2021/DSE/I/10 A	2021/DSE/I/12 C		

SP/DSE/II/9(c)
(i) It is a variable cost because (1)
    it increases with output. (1)

(ii) 600 units (1)

(iii) 600 units (1)

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