5.3 Production planning

Name: _____ Class: _____ Date: _____ **Total: 30 marks**

KEY WORDS supply chain • just-in-case • buffer stock • reorder level • lead time • capacity utilization

Objective

Build the skills to answer exam questions on **production planning** : the supply chain, just-in-time and just-in-case stock control, **stock control charts** , capacity utilization and make-or-buy decisions.

You must be able to:

- explain local and global supply chains and their risks
- compare just-in-time (JIT) and just-in-case (JIC) stock control
- draw and read a stock control chart: buffer stock, reorder level, reorder quantity, lead time, maximum stock
- calculate capacity utilization, productivity and defect rates
- calculate and compare the cost to make and the cost to buy

1 Key knowledge and worked examples

■ Production planning

The **supply chain** is every stage from raw materials to the final customer: suppliers, producers, distributors, retailers. Global supply chains lower costs but are exposed to delays, transport costs, exchange-rate changes and disruption (pandemics, wars, blocked ports).

	just-in-time (JIT)	**just-in-case (JIC)**
idea	stock arrives only when needed	keep extra stock in case of problems
+	less storage cost, less waste, cash not tied up	can meet sudden demand; protects against supply problems
−	needs reliable suppliers; risk of stopping production	storage cost, cash tied up, waste of perishable stock

Stock control chart (a "sawtooth"): stock falls as it is used and jumps up when a delivery arrives.

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- **maximum stock**: the highest level the firm wants to hold;
- **buffer stock**: the minimum level kept for emergencies;
- **reorder level**: when stock falls to this level, an order is placed;
- **lead time**: time between placing an order and receiving it;
- **reorder quantity**: the amount ordered each time.

Capacity utilization $= \dfrac{\text{actual output}}{\text{productive capacity}} \times 100$. Low utilization means high fixed cost per unit; very high utilization leaves no time for maintenance and can lower quality. **Defect rate** $= \dfrac{\text{faulty units}}{\text{total output}} \times 100$. **Productivity rate** $= \dfrac{\text{output}}{\text{input}} \times 100$.

Make or buy: cost to make (CTM) = fixed costs + (variable cost per unit × quantity); cost to buy (CTB) = price per unit × quantity. Also consider quality, reliability, control and spare capacity.

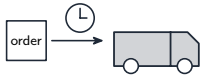
Answer shapes: read the chart or calculate → interpret against capacity or risk → choose a method with a reason.

2 Practice

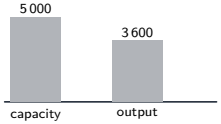
2.1 Define **buffer stock**. [2]



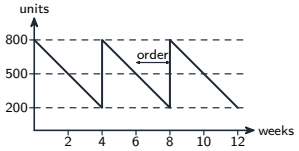
2.2 Define **lead time**. [2]



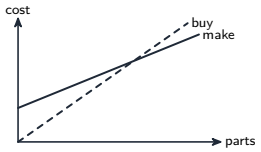
2.3 A kitchen can produce 5 000 meals a week. Last week it produced 3 600. Calculate its capacity utilization, and explain **one** problem of low capacity utilization. [4]



2.4 Using the stock control chart, identify the maximum stock, buffer stock, reorder level and lead time. [4]



2.5 A firm needs 2 000 parts. Making them costs \$10,000 fixed plus \$6 per part; buying them costs \$10 per part. Calculate the cost to make and the cost to buy, recommend one option, and find the quantity at which both costs are equal. [4]



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3 Exam-style questions

3.1 AutoParts Co. makes brake parts for car makers. It holds three weeks of stock of steel and rubber (just-in-case). The new operations manager wants to switch to just-in-time, with daily deliveries from suppliers in another country. Last year a blocked port delayed supplies for ten days.

(a) Distinguish between just-in-time and just-in-case stock control, giving **one** advantage of each. [4]



(b) Discuss whether AutoParts Co. should switch to just-in-time. [10]

Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

the minimum level of stock kept; to meet demand if a delivery is late or demand rises unexpectedly

2.2

the time between placing an order for stock; and receiving it

2.3

$3\,600 \div 5\,000 \times 100 = \mathbf{72}\%$; problem: fixed costs are spread over fewer meals, so average cost per meal is high; explained, e.g. lower profit margin or higher prices than rivals

2.4

maximum stock 800 units; buffer stock 200 units; reorder level 500 units; lead time 2 weeks

2.5

CTM $= 10\,000 + 6 \times 2\,000 = \$\mathbf{22\,000}$; CTB $= 10 \times 2\,000 = \$\mathbf{20\,000}$; buy, as it is \$2,000 cheaper; equal when $10\,000 + 6Q = 10Q$, so $Q = \mathbf{2\,500}$ parts

3.1

(a) JIT: stock arrives only when needed for production; advantage: lower storage costs, less cash tied up; JIC: extra stock is kept in case of problems; advantage: production continues if deliveries are late or demand rises

(b) award up to [10]: JIT cuts storage costs and frees cash from three weeks of stock; less waste and damage of stored materials; car makers often use JIT, so AutoParts may need to match their methods; but suppliers are abroad, so lead times are long and risky; the blocked port shows that a ten-day delay would stop production under JIT; late parts could stop customers' assembly lines and lose contracts; possible compromise: JIT for local or reliable inputs, buffer stock for imported ones / find local suppliers; judgement linked to the case

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