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Lecture 11: Review Session

BUSI4496: Supply Chain Planning & Management

Today’s content

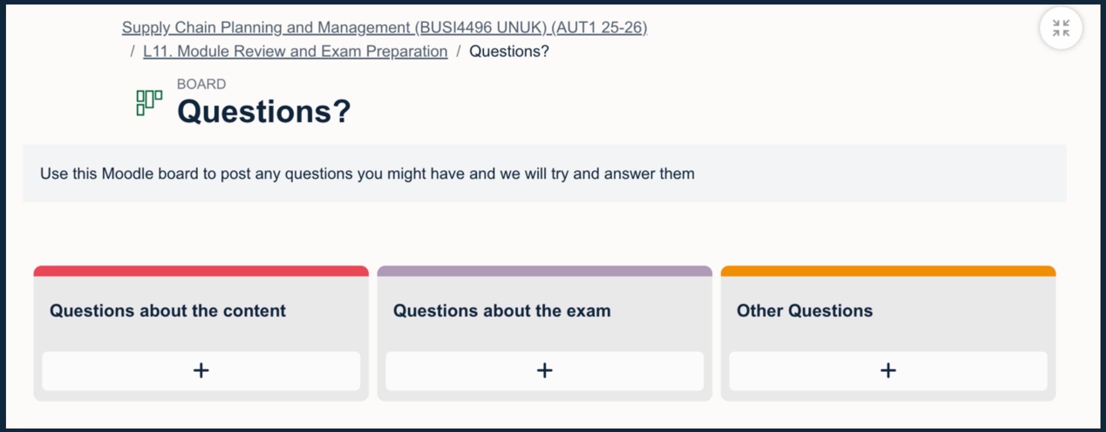
- Module & Content recap
- Examination guidance
- Feedback

Asking questions

Please do ask questions throughout today's session

You can also post your questions to the Moodle board:

https://moodle.nottingham.ac.uk/mod/board/view.php?id=8729232



Module & Content Recap

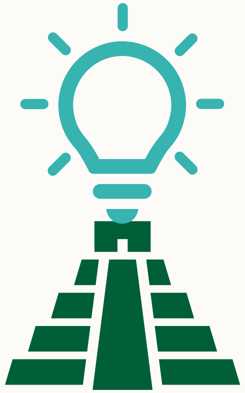
Module & Content Recap

Module Summary

- Integrates both qualitative and quantitative approaches to planning within operations and supply chain management.
- Develops a theoretical understanding of various processes, including forecasting, aggregate planning, inventory management, materials requirement planning (MRP) and Enterprise Resource Planning (ERP) systems.
- The module enhances this theoretical knowledge with quantitative techniques for planning these processes, such as time series analysis, optimization criteria, and EOQ analyses.

Module & Content Recap

Module Aims



To provide a thorough introduction to supply chain management with specific emphasis on the supply chain planning processes relevant to contemporary operations. The module focuses on concepts, processes, models and techniques, and emphasises the role of information integration and enterprise resource planning (ERP) systems.

Module & Content Recap

Lectures

Session	Date (Week)	Topic
Introduction and Theories		
1	29 Sept (w2)	Introduction and Overview
2	06 Oct (w3)	Supply Chain Planning Processes and Systems 1
3	13 Oct (w4)	Supply Chain Planning Processes and Systems 2
Techniques and Applications		
4	20 Oct (w5)	Supply Chain Planning Methods and Techniques 1 - Time Series Forecasting
5	27 Oct (w6)	Supply Chain Planning Methods and Techniques 2 – Inventory Models
6	03 Nov (w7)	Supply Chain Planning Methods and Techniques 3 – Aggregate Planning
7	10 Nov (w8)	Supply Chain Planning Methods and Techniques 4 – Materials Requirements Planning
Cases and further applications		
8	17 Nov (w9)	Supply Chain Planning and Management Contemporary Issues and Cases
9	24 Nov (w10)	Supply Chain Planning Methods and Techniques 5 – Demand Driven techniques
10	01 Dec (w11)	Collaborative Planning and Control across the Supply Chain
11	08 Dec (w12)	Review

Module & Content Recap

Seminars

Session	Date (Week)	Topic
1	17 Oct (w4)	Assignment Preparation
2	31 Oct (w6)	Forecasting Models
3	14 Nov (w8)	Inventory Models
4	28 Nov (w10)	Aggregate Planning
5	12 Dec (w12)	MRP & Capacity Planning

Tutorial Problems and Solutions

- Formula Sheet
- Normal Distribution
- **Forecasting**
- **Inventory Management**
- **Aggregate Planning**
- **MRP**

Lecture 1 – Key revision points

1. **Supply Chain** – can you **define?**

   Feed forward flow of material/Feed back flow of information **– why?**

2. **Supply Chain Management** – can you **define?**

   Right amount, right place, right time **- why** do we need to **integrate?**

3. **Classification** of operational systems

   Flow shop/ Job shop – can you **explain the difference?**

   Make-to-Stock (MTS)//Make-to-Order(MTO) – can you **explain the difference?**

   Can you give **examples?** What are **the advantages /disadvantage** of each?

   What about ATO and ETO? – can you explain where they fit?

4. **Pre-Recorded session**

   The Customer Order Decoupling Point (CODP) – understand that it distinguishes MTS/ATO/MTO/ETO – show in a **diagram**

Example question

What is the difference between a Make-to-Order (MTO) system and a Make-to-Stock (MTS) system and when might each approach be applied to meet demand?

In an MTS system, a customer order is satisfied from finished stock. In an MTO system production is not started until a customer order is received.

[A diagram may be added to illustrate your answer!]

MTS is typically used for fast-moving, high-volume consumer products, e.g. simpler products of relatively low value, such as groceries, food and consumer products. Also, many common high-volume engineering products are made to stock e.g. screws. [There is less risk of products not selling than would be the case for more complex products].

MTO is typically used for slower moving, more complex and specialised products with lower volume and higher value, e.g. industrial machinery products. Aircraft are made to order as are aero-engines. [The customer is often prepared to wait for these products to be produced.]

If the question had asked about $\boxed{\text{advantages}}$ and $\boxed{\text{disadvantages}}$ of each approach:.

The primary advantage of an MTS approach is that it enables rapid response to customer demand – the product is already made.
However, MTS relies on accurate forecasting of what customers will purchase. There is a risk that stock will not sell!

The primary advantage of MTO is that it avoids holding stock of finished products that may not sell. MTO systems typically hold stock of some raw materials only.
However, the customer must wait for the product to be produced. Waiting time may also be delayed if the manufacturer has other order and /or has to wait for components or parts from suppliers.

Lecture 2 – Key revision points

1. Operations and supply chain planning **processes** - **Why do we need** ?

   Satisfy **customers** + operate **efficiently** + provide accurate **information**

   Why does **Tesco** or **Apple** need supply chain panning – **can you explain?**

2. **Hierarchical** Supply Chain Planning – why is it a **hierarchy?**

   Demand forecasting as a business process – forecasts help us to plan

   Inventory basics – what is it/ types/ why hold – economies of scale/buffer protection

3. **Pre-Recorded session**

   Capacity basics - definition of capacity – design capacity/ effective capacity

Lecture 3 – Key revision points

1. **Levels** in hierarchical planning

    Aggregate Planning / Sales & Operations Planning (S&OP) – **what are they?**

    MRP principles - independent and dependent demand **– can you explain?**

    MRPII - introduces **capacity checks** on MRP plans

2. **Pre-Recorded session**

    Enterprise Resource Planning (ERP) systems – **what is an ERP system?**

Forecasting Methods: Summary Table (L4)

Method	When to Use	Key Assumptions	Strengths	Limitations	Typical Applications
Moving Average (MA)					
Exponential Smoothing (ES)					
Regression (Trend Projection)					
Holt's Method (Double ES)					
Adjusted Regression					
Holt–Winters Method					

Forecasting Methods: Summary Table (L4)

Method	When to Use	Key Assumptions	Strengths	Limitations	Typical Applications
Moving Average (MA)	Stationary series with random fluctuations.	No trend or seasonality. Future similar to recent past.	Simple to apply, smooths noise, good short-term.	Lags actual changes, can miss shifts.	Factory output, demand for basic goods, call volumes.
Exponential Smoothing (ES)	Stationary series but may have small, recent changes.	No trend or seasonality. Recent data more relevant.	Reacts more quickly to recent changes than MA, easy to update.	Can overreact to one-off shocks if alpha too high.	Website traffic, stable demand patterns, staffing.
Regression (Trend Projection)	Clear linear trend over time, stable growth or decline.	Trend is linear and stable.	Captures clear trends, easy interpretation.	Doesn't adapt to sudden changes; needs refitting.	Product growth, sales forecasting, enrolment forecasting.
Holt's Method (Double ES)	Trend present but not necessarily stable.	Trend exists, may shift gradually.	Adapts level and trend over time, more flexible than regression.	Sensitive to parameter choice, may over/under shoot if shocks occur.	Subscriber growth, freight volumes, energy consumption trends.
Adjusted Regression	Seasonal pattern with stable trend.	Seasonality repeats in a predictable pattern.	Captures regular seasonal cycles + trend.	Assumes seasonality is stable over time.	Ice cream sales, holiday traffic, monthly retail sales.
Holt–Winters Method	Trend + seasonality, both evolving over time.	Trend and seasonality change gradually.	Very flexible, updates level, trend, season each period.	Needs more parameter tuning, can misfire with shocks.	Airline passenger volumes, tourism demand, retail demand planning.

Handling Data Corrections in Forecasting (L4)

When historical data is corrected, focus on the *sensitivity* of each forecasting method. Ask yourself:

- Which past periods does the method actually use?
- How heavily does it weight each value?

In **MA** the forecast is the *average* of the most recent n data points.

$$F_{t+1} = \frac{D_t + D_{t-1} + D_{t-2} + \cdots + D_{t-n+1}}{n}$$

So, each of the past n data points are equally important and have **equal weight = 1/n** & Older data points (beyond the window n) have **no effect** at all.

In **ES**, forecast is

$$F_{t+1} = \alpha D_t + (1-\alpha)\alpha D_{t-1} + (1-\alpha)^2\alpha D_{t-2} + (1-\alpha)^3 F_{t-2}$$

So, **past data are not equally important,** the **further back** a data point is, the **smaller its influence** on the current forecast. That influence (or weight) shrinks exponentially using this formula: **weight = $\boldsymbol{\alpha(1-\alpha)^n}$.** **n** = number of **periods ago** the value occurred.

This means: the data point from **n years ago** still has about $\alpha(1-\alpha)^n$ **%** influence on the current forecast. It has **diminishing influence**.

Deterministic Inventory Models Summary (L5)

Keep **units consistent** (e.g., weeks vs years, demand per period)

EOQ: Purchasing

How much to order (Q*)?

EOQ formula: $Q^* = \sqrt{\frac{2K\lambda}{h}}$

- K =setup/order cost per order
- λ= demand rate (units/time)
- h= holding cost per unit per time

When to order (R)?

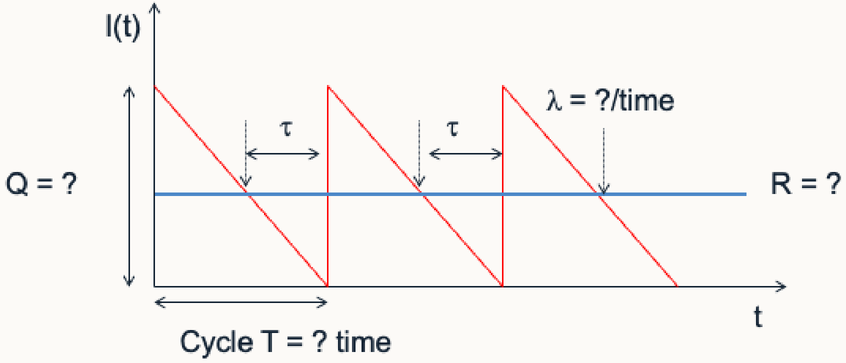
The EOQ model assumes **instantaneous** replenishment

Reorder Point: $R = \lambda\tau$ (=*demand during lead time*= inventory position at order instant)

λ= demand rate

τ= lead time

T= cycle length:
T = Q* / λ



Optimal cost

G(Q*)= $\sqrt{(2K\lambda/h)}$

POQ: In-House Production
How much to order (Q*)?

Use the EOQ logic adapted for **production rate (P)** and **holding cost (h')**.

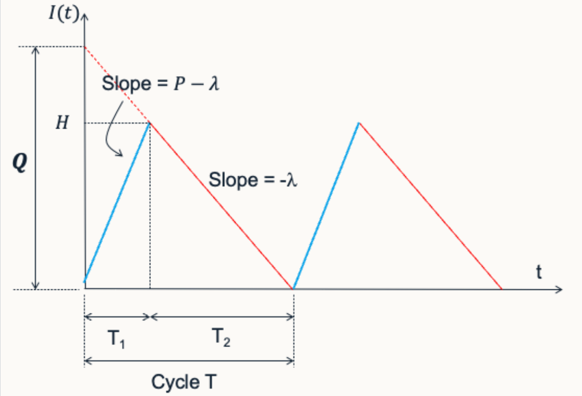
POQ formula: $Q^* = \sqrt{\frac{2K\lambda}{h\prime}}$

h'= $h\left(1 - \frac{\lambda}{P}\right)$

$T = \frac{Q^*_{POQ}}{\lambda}$

Optimal cost $G(Q*)$ = $\sqrt{(2K\lambda h')}$

- The POQ model assumes inventory is replenished **gradually** during a production run. The production is internally scheduled, so, the concept of a reorder point is not needed



(R, Q) Inventory Model: Managerial Approach- Service Level (L5)

Demand Uncertainty during Lead Time

Assumptions

•Lead time remains deterministic: $\boldsymbol{\tau}$

•Annual demand remains stable: $\boldsymbol{\lambda}$

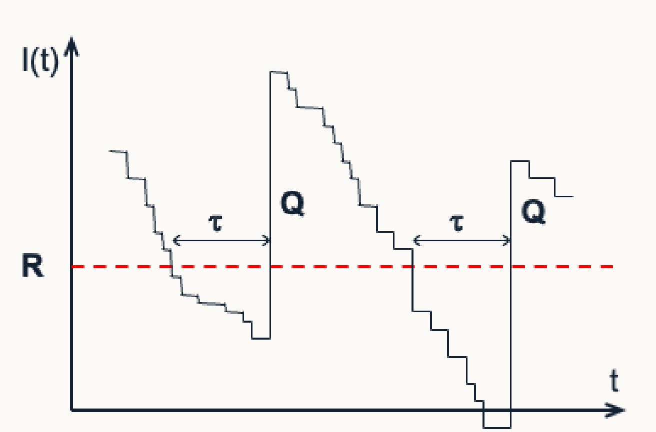
•Demand variation during lead time follows the normal distribution: N($\lambda\tau$, σ) or $N(\mu_L, \sigma_L)$

How much to order (Q*)?
use the EOQ formula

When to order (R)?
R = **expected** demand during lead time **+ safety stock (SS)**

R = $\lambda\tau$ + SS

$(SS = z\,\sigma : \mu = \lambda\tau)\ R = \lambda\tau + z\,\sigma$ OR $R = \mu_L + z\sigma_L$

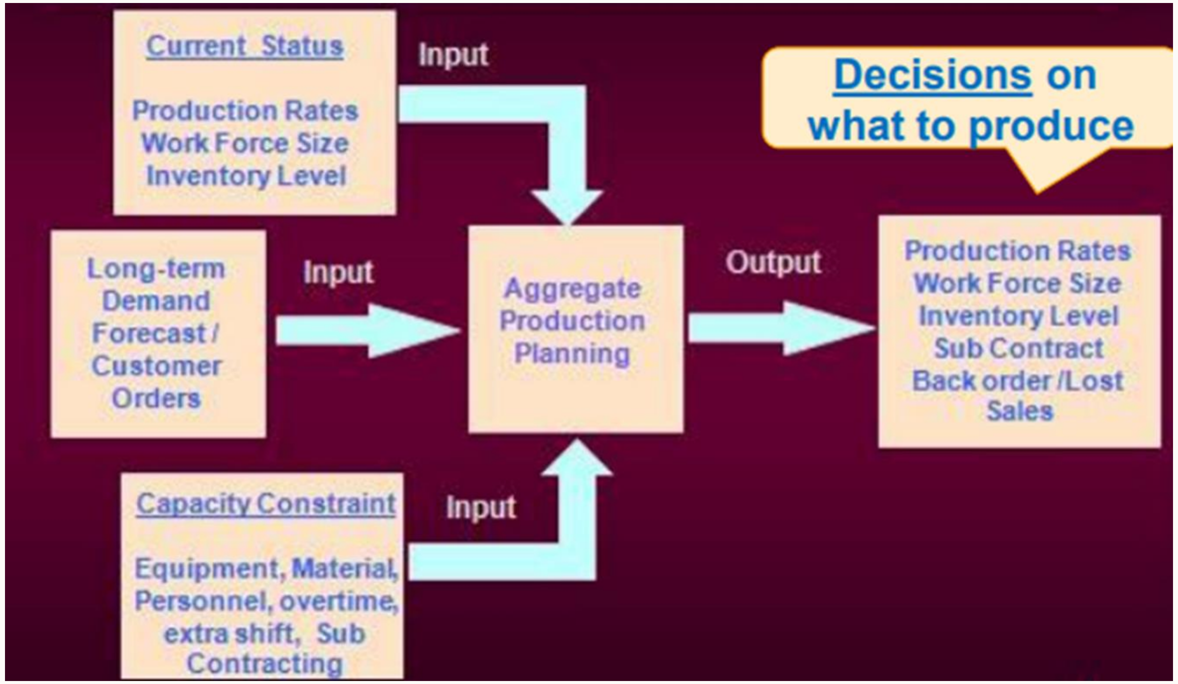


How to calculate SS and z ?Service level models: type 1 / type 2
Type 1 Service: Probability of not stocking-out during lead time (α)
Type 2 Service (Fill rate): Proportion of demands immediately met from stock (β)

$$\frac{n(R)}{Q} = 1 - \beta, \qquad n(R) = \sigma L(z)$$

AGGREGATE PLANNING(L6)

Decide, at a gross level, the products to produce in terms of volume and mix for given operational facilities with projected capacities and resources over a medium to long time horizon (dependent on sectoral characteristics)



Aggregate Planning(L6)

What is aggregate planning:

- Purpose of an aggregate plan
- Trade offs to be made
- Associated costs

Aggregate planning in the hierarchy of production planning decisions

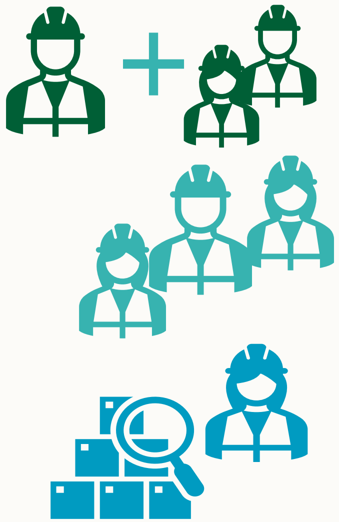
Aggregate units of production

- Shared characteristics vs differing characteristics
- Working hours / production

Aggregate planning strategies

- Chase
- Minimum constant workforce

Calculations!



Material Requirements Planning (MRP) (L7)

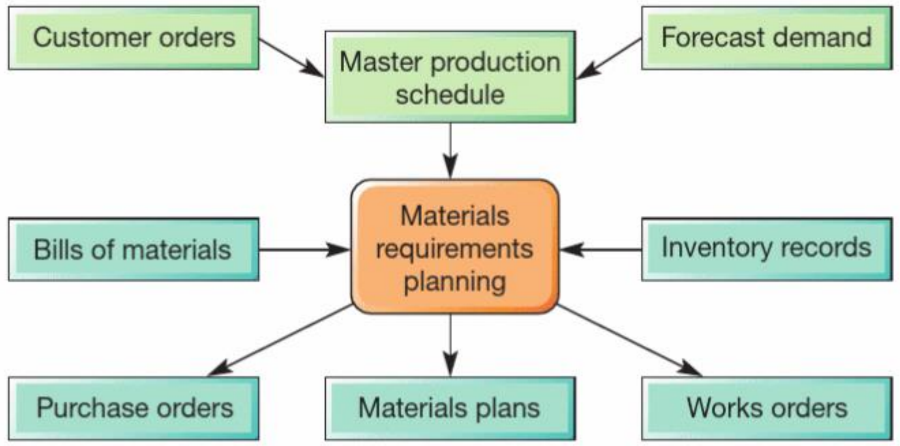
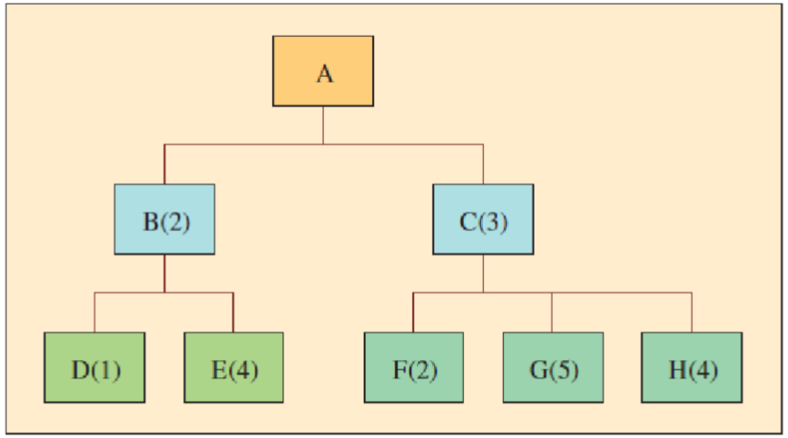


Figure 14.9 Materials requirements planning (MRP) schematic



Product structure diagram

Assumptions: demand, lead time, capacity constraints…

Calculations in MRP:

- Explosion calculus
- Lotsizing (lot-for-lot)
- Capacity constraints (shifting procedure)

Materials Requirements Planning – BOM, master product products and services require materials, modules, subassemblies, components, Once the MPS is fixed, the MRP 'engine' does the computations to meet finished product delivery requirements.

It converts product requirements into requirements for components through 'time-phased parts explosion'

Material Requirements Planning (MRP) (L7)

A Lot for Lot policy aims to minimise inventory & thus requires an order to be placed **each** period…

Other approaches: EOQ? Lot shifting?

We can check for feasibility: using checking the cumulative demand and cumulative capacity

Loft shifting is a heuristic: the production plan obtained through this technique is not necessarily optimal

Once a feasible plan has been identified can it be improved upon?

Lecture 9 – Key revision points

1. Kanban, JIT and Lean

   What is **Kanban** control? How is extended in **JIT?**

2. Theory of Constraints (TOC) /DBR

   Can you explain the **5 focusing steps** and how we get the most from the constrained resource?

3. Product variety and postponement strategies

4. Pre-Recorded session

   Mass Cusomisatsion and Quick Response

Lecture 10 – Key revision points

1. Planning and control **across the supply chain**
2. **The Bullwhip Effect**

   What is it? **Why** does it happen? How can we **minimise its effects?**
3. **Collaboration** in supply chain planning and management

   Continuous replenishment systems, Vendor Managed Inventory **(VMI)** , Collaborative Planning, Forecasting and Replenishment **(CPFR)**

   –**can you explain each** of these?
4. Blockchain solutions for traceability and transparency?
5. Pre-Recorded Session

   Performance Measurement in Supply Chain and Operations – the SCOR model

Examination Guidance

Examination Guidance

The Exam paper

Three sections: Section A, Section B and Section C

- Each section is **equally weighted**

Spend approx. 40 minutes on each Section

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Nottingham University Business School

A Level 4 Module Autumn 2025/26

SUPPLY CHAIN PLANNING & MANAGEMENT

Instructions:

Time allowed: TWO hours

Answer ALL parts of the question in Section A, ONE question in Section B and ONE question in Section C.

Candidates may complete the front cover of their answer book and sign their desk card. **DO NOT turn the examination paper over until instructed to do so.**

Only a calculator from approved list A may be used in this examination.

Basic Models	***Scientific Calculators***	
Aurora HC133	*Aurora AX-582*	*Casio FX82 family*
Casio HS-5D	*Casio FX83 family*	*Casio FX85 family*
Deli – DL1654	*Casio FX350 family*	*Casio FX570 family*
Sharp EL-233	*Casio FX 991 family*	*Sharp EL-531 family*
	Texas Instruments TI-30 family	*Texas BA II+ family*

Permitted resources:

Those whose first language is not English may use a standard translation dictionary to translate between that language and English provided that neither language is the subject of this examination.

Prohibited resources:

All other dictionaries, including subject specific translation dictionaries and electronic dictionaries. Electronic devices capable of storing and retrieving text.

Appended material: NONE

Additional material: Formula Sheet and Normal Distribution Table

Information for Invigilators: NONE

Exam Papers must not be removed from the examination venue

Examination Guidance

The Exam paper

Section A:

Four compulsory short questions

- Two qualitative and two quantitative
- Answer ALL questions

Qualitative:

- explain a concept
- Use illustrations where asked

Quantitative:

- Short calculations related to Lectures 4,5,6&7.

SECTION A
Answer **ALL parts of the question** in this section

1)
a) Qualitative..
[25%]

b) Qualitative ....
[25%]

c) Quantitative ....
[25%]

d) Quantitative ....
....
....
....
[25%]

Examination Guidance

The Exam paper

Section B:

Two longer quantitative questions

- Choose **One** question to answer
- Show/explain your workings
- Interpret results if asked!
- Revise tutorial problems and additional content

SECTION B

Answer **ONE question** in this section

2) Quantitative question

....

....

....

a) Calculate...

[15%]

b) Using...

[45%]

c) Assuming...

[45%]

3) Quantitative question

....

....

a) Calculate...

....

[30%]

b) Find...

....

[35%]

c) Find...

....

[35%]

Examination Guidance

The Exam paper

Section C:

Two longer qualitative questions

- Choose **One** question to answer
- Revise example questions and answers at end of lecture 1,2,3,9 self-study sections

SECTION C

Answer **ONE question** in this section

4) (a) Describe why Company X...

[60%]

(b) How should Company X...

[40%]

5) (a) Help Company Y...

[60%]

(b) Company Y wants to ....

i) Option A...

[20%]

ii) Option B...

[20%]

Any questions?

Questions

Feedback

Feedback

Take 5 minutes to complete the module feedback survey:

- Visit https://bluecastle-uk-surveys.nottingham.ac.uk or scan the QR code
- Log in with your university username and password.
- Click on “Supply Chain Planning and Management”

Thank You for your contributions!

- We hope you learned lots and want to develop your understanding further in semester 2 and in your Summer projects
- Your assignments may have given you ideas for topic you want to investigate next Summer!
- We hope to see happy and smiling in the New Year!

A final word…

GOOD LUCK IN YOUR REVISION AND FOR YOUR EXAM

THANK YOU FOR YOUR ENGAGEMENT THROUGHOUT THE MODULE

AND HAVE AN ENJOYABLE/RESTFUL/QUIET/BUSY BREAK!

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Thank you