

## **WJEC IT3 - POSSIBLE NEW QUESTIONS FOR SUMMER 2017**

Below is a list of specification areas which have never been questioned before. It may be worthwhile to gain some kind of understanding of each of these areas if you have time to do so.

### **NETWORKS (TOPIC 1)**

- A) Diagram / advantages / disadvantages of bus topology
- B) Selection of the suitable topologies for LAN and WAN
- C) Security strategies
- D) Configuration management

### **THE INTERNET (TOPIC 2)**

- A) How a search engine works, how webpages are added to search engine lists

### **DATABASE SYSTEMS (TOPIC 6)**

- A) Restructure data into normalised form
- B) The purpose of a DBMS (database management system)
- C) The purpose of query languages
- D) The purpose of data dictionaries

### **MANAGEMENT INFORMATION SYSTEMS (TOPIC 8)**

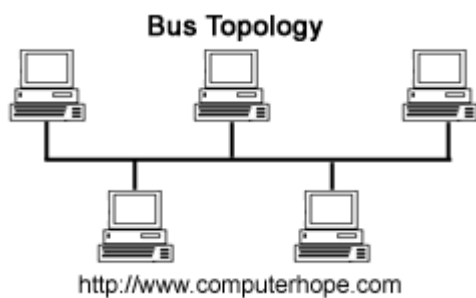
- A) Draw/interpret a data flow diagram

### **SYSTEM DEVELOPMENT LIFE CYCLE (TOPIC 9)**

- A) Methods of avoiding post-system-implementation costs
- B) A question about technical and user documentation
- C) Criteria for evaluating a system
- D) Tools for gathering information for the evaluation report

## Networks – Topic 1

### A) Diagram / advantages / disadvantages of bus topology



#### Advantages:

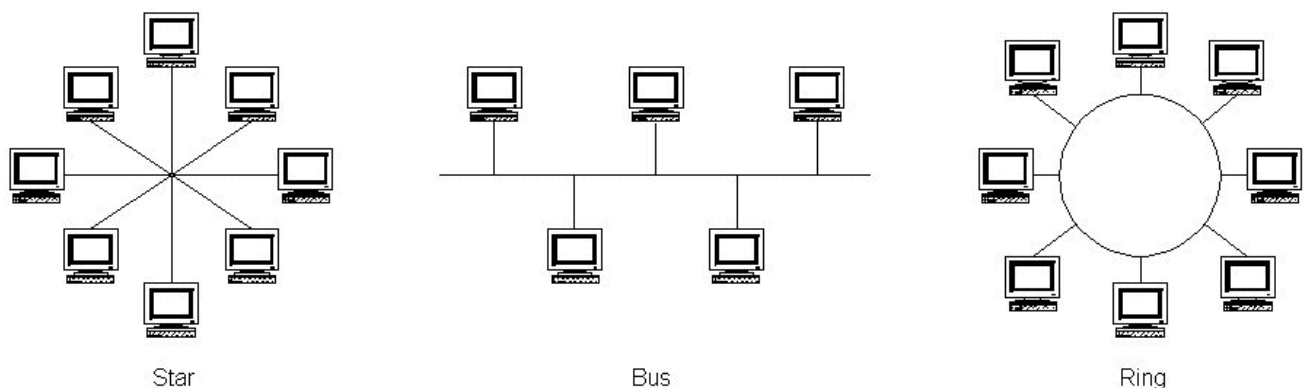
- Cost effective as only a small amount of cabling is needed.
- Simple cable runs make this type of network easy to install.
- Easy to add extra computers to the network.

#### Disadvantages:

- If there is a break in the backbone cable, then the network will stop working.
- Not very load tolerant so performance will degrade if more than around 12 devices used.

### B) Selection of the suitable topologies for LAN and WAN

There are three possible topologies:



Consider that:

**LAN (Local Area Network):** a computer network that links devices within a building or group of adjacent buildings, especially one with a radius of less than 1 km.

**WAN (Wide Area Network):** a computer network in which the computers connected may be far apart, generally having a radius of more than 1 km.

### Deciding on the appropriate topology for the LAN and WAN

The bus topology is common with LANs but is impractical to implement as a WAN. This topology sees multiple nodes connected to a length of “backbone” cable.

For both bus and ring, a break in the cable would cause the entire WAN to stop working which is not ideal. The fault may also be difficult to locate and repair, suggesting long periods of downtime. It is also the case for bus and ring that the greater the number of computers connected to the network, the slower performance will be. WANs typically have many devices connected at once therefore these two would not likely be appropriate for a WAN.

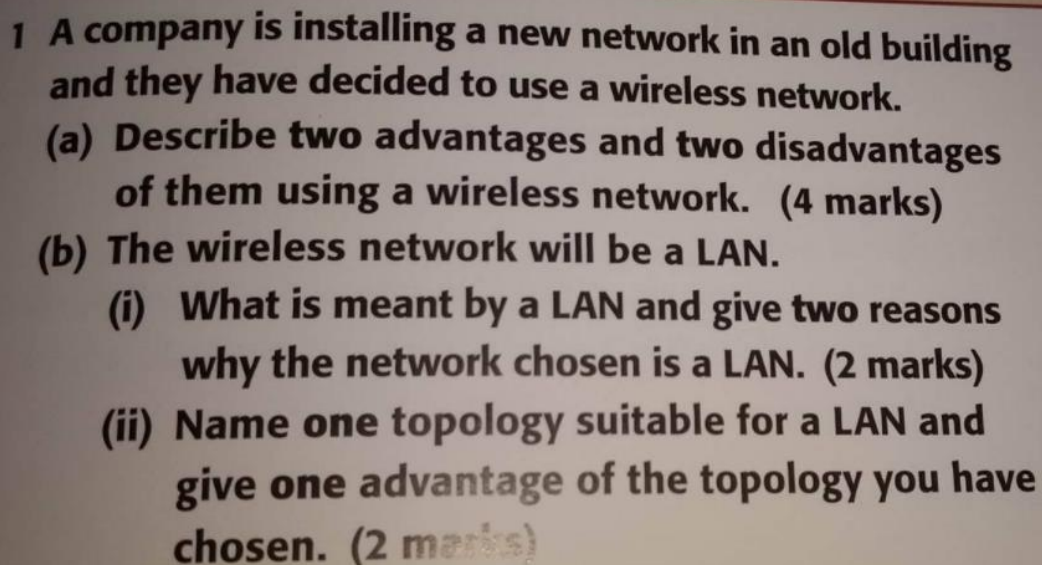
While it is true that LANs will likely work fine on any three of ring, star or bus it must be stressed that due to the limitations of bus and ring, the star topology would most probably be the most suitable for a WAN as there can be a central server in a datacentre with as many stations branching off as is necessary.

Different speeds are possible on different arms/spokes of the network and it is load tolerant, meaning that extra computers can be added without much loss in performance because all computers have their own path to the server. Star topologies are also fault tolerant meaning that if one of the cables fails then the other computers can still be used.

Various other considerations regarding the appropriateness of various topologies to the different scales and sizes of LANs and WANs may be made in the evaluation.

**In your evaluation, it is likely wise to bring together the advantages and disadvantages of ring, star and bus which you should already know from mark scheme learning and the first page of this document. Consider how these different advantages and disadvantages would apply to a small scale (LAN) and a large scale (WAN) and make a conclusion on which is likely to be best.**

Review the below question, particularly b) (ii) and possibly (i):

- 
- 1 A company is installing a new network in an old building and they have decided to use a wireless network.**
- (a) Describe two advantages and two disadvantages of them using a wireless network. (4 marks)**
- (b) The wireless network will be a LAN.**
- (i) What is meant by a LAN and give two reasons why the network chosen is a LAN. (2 marks)**
- (ii) Name one topology suitable for a LAN and give one advantage of the topology you have chosen. (2 marks)**

C) Security strategies

Security Strategies The use of networks exposes organisations to a range of security threats, so strategies regarding the use of networks need to be developed to minimise threats. There are a range of methods available:

## **Security strategies**

The use of networks exposes organisations to a range of security threats, so strategies regarding the use of networks need to be developed to minimise these threats.

There are a number of ways in which software can help with a security strategy:

- Use of passwords and user-IDs – used to authenticate a user of a network. Ensures that access is restricted to authorised users.
- Virus checkers – all computers have the latest virus checking software loaded which scans the computer and all files, e-mails and instant messages for viruses. If viruses are detected, they can be removed automatically.
- Firewalls – can be software, hardware or both and protect the network from hackers.
- Encryption – used to keep data secret when being sent over networks. Used for financial details (e.g., bank details, credit card details, etc.) when being sent over the Internet.

D) Configuration management

## **Configuration management**

Once a network has been created, it is necessary to configure it to maximise its performance. Network configuration management is the process of organising and maintaining all the information about a network.

When a network needs modification, repair, expansion or upgrading, the network manager/administrator will refer to the network configuration database to determine the best course of action. The network configuration database contains the locations and network addresses of all hardware devices used in the network and also information about the programs, versions and updates of the software installed on the networked computers.

The advantages in using configuration management software are:

- It is much easier to repair, expand or upgrade the network.
- The network will be optimised and so will run faster.
- There will be less network downtime owing to better management of the network.
- Network security will be optimised.
- It is possible to roll back changes to a previous configuration if changes made to a network adversely affect its performance.
- It keeps records of all the changes made to a network so you do not need to write down the new settings.

## The Internet – Topic 2

- A) How a search engine works, how webpages are added to search engine lists.

### **How a search engine works**

Before a search engine can find information, it needs to store information about all the webpages stored on the Internet. There are hundreds of millions of webpages stored, so this is not an easy task but it is not done manually. Instead, a web browser called a web crawler (sometimes also called a web spider) automatically follows all the links it can find and then each webpage it comes across is analysed for content such as headings and sub-headings, key words, etc., to see how it should be indexed. This index is stored in a database. The data the web crawler finds about each webpage is added to this index.

When a search engine is used to perform a search using a number of key words, the search engine examines the index for these words and produces a list of the webpages which have the best match.

Usually as well as the title of the webpage some brief details about the content of the webpage are given. Many search engines rank the pages by relevance to the search condition with those with the greatest relevance being listed first.

### **Web crawler**

A web crawler, also known as a web spider, is a program that automatically browses all webpages in a systematic manner. It does this to provide up-to-date data about webpages in order to produce an index which can be used by a search engine to enable fast searches.

### **How webpages are added to search engine lists**

There are a number of ways by which webpages are added to a search engine list and it depends on the search engine being used. Generally a search engine will rank the webpages a particular search produces according to the following:

- the most relevant match to the search condition
- the most popular site
- the most authoritative site
- the ability of a company to pay for a higher ranking (not all search engines allow this).



## Database Systems – Topic 6

- A) Restructure data into normalised form

# Normalisation

- **1NF**
- A table is in **First Normal Form (1NF)** if there are **no repeating groups or data**.
- **2NF**
- A table is in Second Normal Form if it is in 1NF and it has **no partial dependencies** (*also called functional dependencies*).
- **3NF**
- For a table to be in 3NF it must be in 2NF and have **no transitive dependencies**.



DATE OF BIRTH	MODULE NO	MODULE NAME	LEVEL	MODULE DURATION	COMPLETION DATE	RESULT
25/06/86	100	Learning to juggle	1	30	10/10/04	Pass
	200	Acrobatic balancing	2	60	23/06/04	Pass
	250	Static trapeze Intermediate	2	60	05/03/04	Pass
02/03/87	330	Advanced juggling	3	100	10/10/04	Merit
	345	Static trapeze advanced	3	100	05/03/04	Distinction
	210	Flying trapeze	2	60	13/01/05	Pass
17/04/86	200	Acrobatic balancing	2	60	32/05/04	Unclassified
09/10/87	100	Learning to juggle	1	30	19/10/04	Pass
	102	Fire eating for beginners	1	30	02/07/04	Merit
	250	Static trapeze Intermediate	2	60	12/03/04	

Normalisation Demonstration

Adam McNicol

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1,001 89

View this short clip to gain an understanding of how to carry out the process of putting data into normalised form:

<https://www.youtube.com/watch?v=fg7r3DgS3rA>

- B) The purpose of a DBMS (database management system)

Database Management Systems are applications to hold a centralised collection of structured data.

A DBMS is a method for managing the interface between the data that an organisation stores and the program that it uses to access the data. Typically, an organisation will store its data in a series of connected data files, e.g. a relational database.

### *Advantages*

- There is a greater degree of data standardisation within the organisation. Users are obliged to use the same data definitions and work within the confines of the data dictionary.
- Security is improved because the database is centrally located and access to it can be controlled.
- Data is independent from the programs that interact with it. This means that new programs can be created without developers having to worry about creating or amending underlying data structures.
- It is an economical use of organisational resources. The data only has to be stored once. It can then be accessed by the different functional area of the organisation. This creates savings in terms of hardware and memory requirements.

### *Disadvantages*

- The creation and maintenance of a large scale DBMS will be costly. It is likely to require expensive hardware, considerable memory resources and high-specification processing devices. Cost may also be incurred acquiring the necessary staff expertise.
- Security procedures have to be detailed and extensive if an organisation's data resources are all centrally located. The organisation is more vulnerable to a disastrous data loss and so will need a well-maintained disaster recovery policy.
- Database management systems are complex products. In developing associated programs, developers will need to understand all of their workings. The training and additional time that this might involve will add to development costs.



- C) The purpose of query languages

Remember from IT1 that:

### **Query** **Definition**

A query is when you interrogate (search/sort/filter) a database to find some information.

### Query Language

A query language allows the user to enter a set of parameters/commands in order to retrieve, sort, edit and delete information from various parts of a relational database.

An example is the Structured Query Language (SQL) and allows the user to get the information they require from the right table and field, and will also allow them to make changes to the data if required using parameters such as SELECT, FROM, WHERE and UPDATE.

- D) The purpose of data dictionaries

A data dictionary is a set of information describing the contents, format, and structure of a database and the relationship between its elements.

## **Data Dictionaries**

***A data dictionary defines all data items in a database. This includes:***

- Table name (entity)
- Field names (attributes)
- Field types
- Field lengths
- Validation
- Relational links and keys

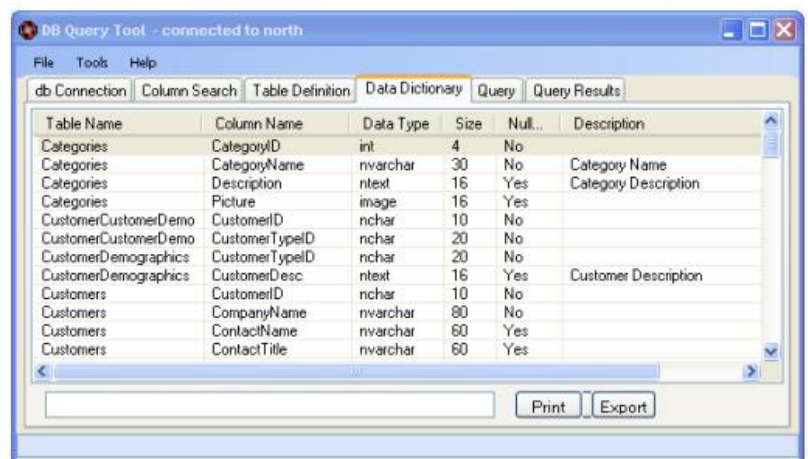


Table Name	Column Name	Data Type	Size	Null...	Description
Categories	CategoryID	int	4	No	
Categories	CategoryName	nvarchar	30	No	Category Name
Categories	Description	ntext	16	Yes	Category Description
Categories	Picture	image	16	Yes	
CustomerCustomerDemo	CustomerID	nchar	10	No	
CustomerCustomerDemo	CustomerTypeID	nchar	20	No	
CustomerDemographics	CustomerTypeID	nchar	20	No	
CustomerDemographics	CustomerDesc	ntext	16	Yes	Customer Description
Customers	CustomerID	nchar	10	No	
Customers	CompanyName	nvarchar	80	No	
Customers	ContactName	nvarchar	60	Yes	
Customers	ContactTitle	nvarchar	60	Yes	



Remember that you will have made a data dictionary for your IT4 coursework project.

## Management Information Systems – Topic 8

### A) Draw and Interpret a Data Flow Diagram

#### ***The flow of information between external and internal components of an MIS***

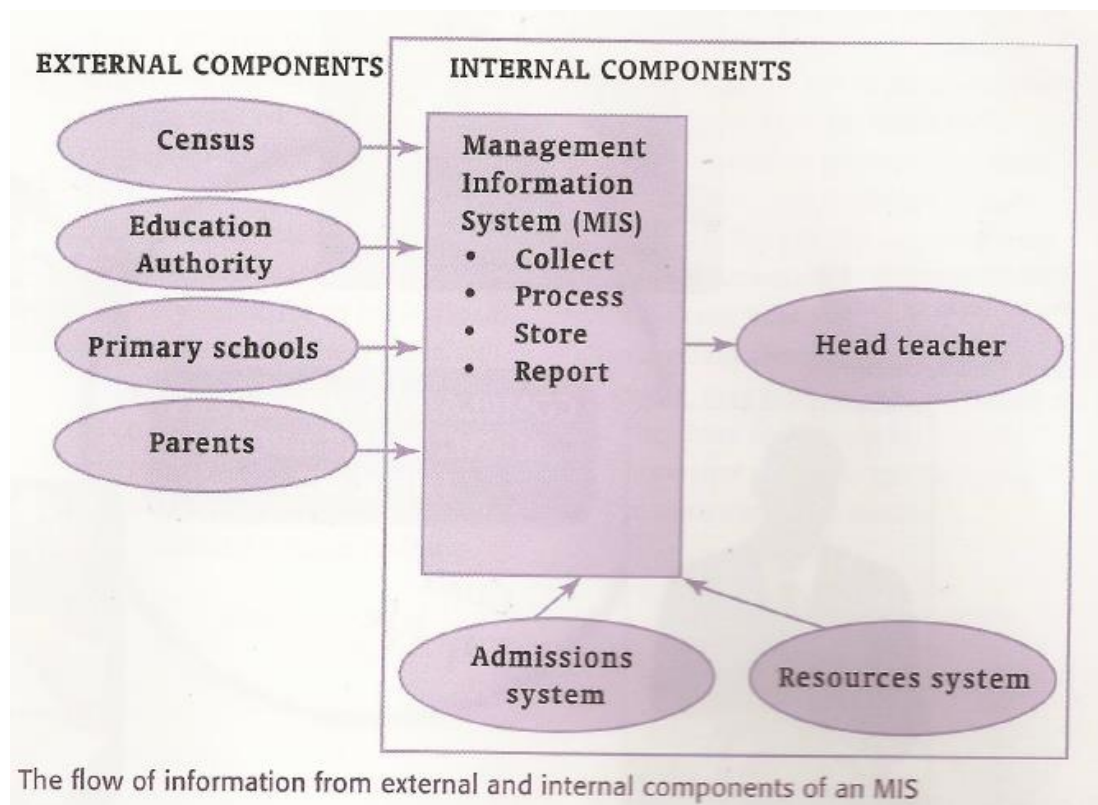
MIS use data that is both internal and external to the organisation. For example, an MIS to produce information about the effectiveness of a marketing campaign may include information about competitors as well as information about costs and sales from their internal ICT systems.

Schools use MIS in various ways. For example, for long-term planning they would need to ensure they had the resources to cope with increases in the population.

Internal information might include admission figures from previous years, details of brothers and sisters of existing pupils who will eventually start at the school, details of resources such as staff, rooms, desks, etc.

External information sources could be figures from primary schools, census details (for indications of population), details of immigration, local authority data, etc.

The following diagram shows the sources of information and the information flows. The entities (i.e., suppliers or receivers of information) are shown in oval boxes and the processes are written inside the shaded box. The overall box marks the internal system boundary.



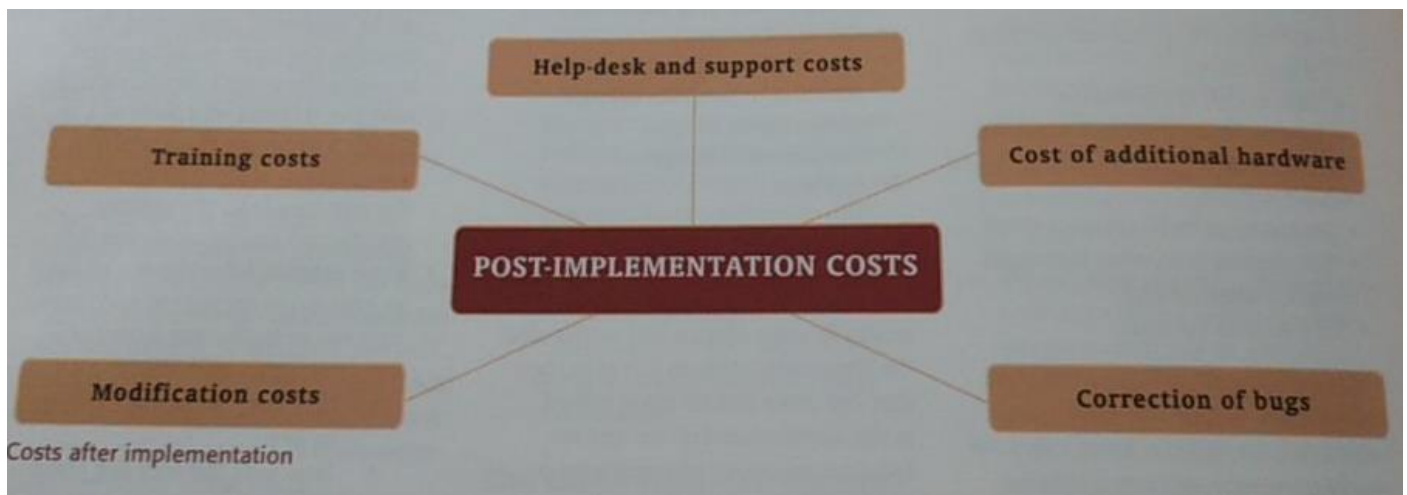
## System Development Life Cycle – Topic 9

### A) Methods of avoiding post-system-implementation costs

**Methods of avoiding post-implementation cost**

Once a system is built and is starting to be used, the costs of the system do not end and some of these costs include:

- Training costs – the initial training may not have covered all of the software, or new software modifications may be needed and this can lead to additional training.
- Modification costs – the software may not perform all of the tasks the user required, so additional modification to the system is needed. With better identification of user requirements these post-implementation costs can be reduced.
- Help-desk and other support costs – if training had been complete and the software had been easy to use then these additional costs can be minimised.
- Need to purchase additional hardware – organisations often expand so systems need to be made larger by the addition of more storage, faster processors, etc. Systems should be built with plenty of additional capacity initially to reduce these further costs.
- Correction of bugs – with comprehensive testing these should not occur or should at least be reduced.



### B) A question about technical and user documentation

#### User Documentation

This is a user guide or manual which a user can turn to when learning how to do a new procedure or to help them solve a problem that they have encountered.

User documentation should include guidance surrounding: (You should have done one of these in IT4 c/w)

- How to load the software.
- How to carry out various tasks
- How to save
- How to print
- How to back up
- Frequently asked questions

#### Technical Documentation

This should be compiled by the system designers and developers and will include explanations of the various workings of the system itself. Any user interface designs, the data dictionary and the flowcharts/ERDs etc...

It would be referred to by technical personnel such as programmers or systems analysts when dealing with the system and would answer many questions about the internal complexities of the system.

C) Criteria for evaluating a system

When evaluating a system after it has been implemented, the following should be taken into account:

- How well the original user requirements have been met by the new system.
- Assessment of how happy clients are with the development of the new system.
- How well the system ensures the security of data and programs.
- The reliability of the system overall.

D) Tools for gathering information for the evaluation report

- Quantitative test: it is always easier if the performance of a system or the user satisfaction can be expressed numerically. For example, users might be asked “How satisfied are you with the system on a scale of 1-5”.
- Questionnaires: Users can be given a series of questions to collect information about their level of satisfaction with the system, with an ability to voice concerns at length.
- Error logging interviews – Calls to the help desk are logged so these can be used to evaluate how easy the system was to use and how often it may have crashed for users etc...