General Comments

Overall the quality of answers compared with previous years was higher. Candidates appear to be spending too much time on the short answer sections. Candidates need to improve examination techniques and use bullet points more effectively.

QUESTION ONE

a) **Information systems development requires careful thought and planning. Several methods are available to support the development.**

Give examples and a brief overview of the main stages in THREE of the following:

   i)   **Waterfall method**
   ii)   **A soft system method**
   iii)   **A specified structured method**
   iv)   **A prototyping method**   **(15 Marks)**

b)   **Using any system as an example, describe the use if the following techniques:**

   i)   **Normalisation**
   ii)   **Data flow diagrams**
   iii)   **Logical data model**   **(15 Marks)**

This question was popular and answered reasonably well. It was rather open ended and gave the candidates the opportunity to show what they knew about different methods and techniques

Very few candidates knew anything about soft systems methods. They also found it difficult to distinguish between the traditional waterfall method and structured methods. It was pleasing to see that they do seem to understand normalisation, some good examples and explanation were given. A few mixed up data flow diagrams and logical data models.

Answer pointers:

Waterfall method – Traditional software development lifecycle each phase following the next on completion. The phases are: feasibility, analysis, design, coding, testing, implementation.

Prototyping (e.g. RAD) – Iterative production of a model involving users designing basic input/output screens. Types such as evolutionary, throw away, spiral could be included.

Structured Methods (e.g. SSADM, YSM) – Provides analysis and design techniques in a structured manner. Typical phases – requirements specification, technical and business options, logical and physical design.

Soft System Methods (e.g. ETHICS) – Socio-technical approach to analysis and design introducing rich pictures, CATWOE and root definitions.

Normalisation – a diagrammatic representation providing simple, stable structures to reduce redundancy and replication. Forms from first to third are commonly used. 1NF removes repeating groups, 2NF deals with partial dependencies and 3NF removes transitive dependencies.

Data flow diagrams – depict the flow of data in the systems under investigation identifying external entities, data stores, processes and data flows between them.

Logical data model – depicts the relationships between entities. Various degrees exist namely one to one, one to many and many to many. Optionality is also important as it indicates whether it is imperative for an entity to belong in the relationship.

QUESTION TWO

a) **Define the main role and typical functions of a database management systems (DBMS).**   **(10 Marks)**

b) **Describe the main theories of a relational database approach to storage and accessing data.**   **(10 Marks)**

c) **Object-oriented concepts are widely used within web application development.**

Explain, using examples, the following:

>   *i)*   **Class**
>   *ii)*   **Type**
>   *iii)*   **Method**
>   *iv)*   **Inheritance**
>   *v)*   **Persistence**   **(10 Marks)**

This question was answered in a reasonable manner. Most candidates could define a database management system, but a few described a database administrator. Always read the question!

Object oriented concepts and the definition of a relational database were understood reasonably well.

Answer pointers:

a) DBMS - this is complex software that describes, stores and manipulates data within a defined structure. It provides control, effective automatic recovery, integrity and security.

b)   Data is stored as values in rows of columns within tables. Each row is accessed via a primary key and can be related to another table using a foreign key. Duplication of data is reduced using normalisation techniques. Integrity constraints are supported. It is process independent; changes can be made to the table without affecting the process. The theory is based on relational calculus, providing project, select, joins, etc.

c)   Class - this is a set of objects which have the same internal structure, attributes and methods e.g. TUTOR
(ii) Type - models the common features of a set of objects that have the same feature c.f. abstract types e.g. PERSON
(iii) Method - manipulates objects e.g. get
(iv) Inheritance - a class can be defined as another instance of one or more existing classes, inheritance means the class will adopt both attribute and method of the other class e.g. TUTOR and STUDENT
(v) Persistence - is implicit in the creation of an instance of a class e.g. the insertion of an object into the database is persistent until it is deleted.

QUESTION THREE

a)   A software house that sells commercial applications is to set up a Help Desk for customers with problems or complaints. Information from the calls received is to be stored on a database for subsequent solution and analysis.

   i)   **Design screen input on which the Help Desk staff can record the details of the call.**
                                                                                       (8 Marks)

   ii)   **Design a simple data model which will need to be implemented for your screen.**
                                                                                       (3 Marks)

   iii)   **Define the validation needed for typical fields.**
                                                                                       (4 Marks)

b)   Fact finding techniques such as interviews and questionnaires would be required to enable you to design the above system.

   i)   **Draft a memo to your manager describing the benefits and drawbacks of using these techniques.**
                                                                                       (12 Marks)

   ii)   **Give an example of an 'open' question and a 'closed' question which could be used in your questionnaire.**
                                                                                       (3 Marks)

Answers were disappointing; candidates do not seem to be able to design screens which would be functional. There was considerable misunderstanding in what a data model is, although some attempts were made.

Answer pointers:

a)   Simple, well designed screens are expected, with appropriate field headings, help facilities, navigation aids etc
The data model would simply contain Customer, Problem, Solution plus others.
Validation would be very simple e.g. checking the customer number is valid and exists, marks would be obtained for inclusion of categories or severity of problem

b)   Advantages of interviews: Can be structured, personal, good for obtaining ideas, problems
Disadvantages: Reactive, can be off putting, demotivating, time consuming etc.
Advantages of questionnaires: Good for obtaining detail, can be used for many sources, geographical,
Disadvantages: difficult to design, response is poor
An open question is one, which allows opinions and full answers e.g. what are the problems with the system?
A closed question is one that expects a simple answer e.g. how many customers do you have?

QUESTION FOUR

Activity Code	Description	Duration (Weeks)
1-2	Feasibility Study	2
2-4	Systems Analysis	3
4-7	Analysis Report	1
7-8	Systems Design	6
8-9	Design Report	1
9-10	Testing	2
10-11	Implementation	2
11-12	Review	2
2-3	Evaluate Hardware	8
3-6	Order Equipment	2
6-9	Delivery & Installation	2
2-5	Design Office Layout	1
5-9	Office Alteration	8

The above table shows the activities that need to take place in the design of an information system development project. The activity that takes place between nodes m and n.

a)   **From the information above, draw the network diagram and indicate the critical path of the project.**   **(12 Marks)**

b)   **As manager of this project, describe the steps you would take to ensure a quality project was produced on time.**   **(9 Marks)**

c)   **There are several ways that can be used to implement this new system. Describe THREE different ones.**   **(9 Marks)**

Not many candidates attempted this question, most of those who did had some idea about network charts. Some miscalculations caused loss of marks. Very few answers included project management techniques most concentrated on the system development life cycle.

Answer pointers:

a)   A normal Pert Chart with earliest, latest and float will indicate the critical path :
1- 2, 2-3, 3-6, 6-9, 9-10 and so on
b)   Allocation of tasks, resources, implementation of a good project management system, use of structured methods, techniques, regular progress meetings, structured walkthroughs etc
c)   Direct – this is when a system is implemented as soon as it is set up. It can be dangerous because there is no way back, but time is saved. It is usually used when the system did not exist prior to the implementation.
Parallel – this is the most common method, whereby the old and new systems are run in parallel until the user and designer is satisfied. It is costly in time and resources but the safest method
Phased implementation – this is usually used when a system is to implemented on more than one site, or the system has been designed in phases. It allows limited use which could be recovered in the event of a failure and prevents too much interruption within the organisation.

QUESTION FIVE

List and briefly describe FOUR major sources of business information that you, as an information systems consultant, would need to consult in order to investigate and understand the business processes and activities of a large organisation. **(12 Marks)**

The best answers came from candidates who had direct experience of the business processes within their own sphere of work. Thus specific cases could be provided to give some context to candidates answers. It was disappointing to see some candidates who completely missed the point of the question, indicated by answers which covered a wide range of topics peripheral to fact finding and elicitation of information.

Answer pointers:

Areas where information could be gathered include

1)   The Public Domain - e.g. Company Internet site, journals, newspapers etc
2)   Current systems - e.g. organisation specific data can be extracted from manual and computer based systems
3)   Senior management - e.g. undertake interviews to determine key policy issues and views on ways to improve existing systems and to identify inefficiencies.
4)   Experienced Users and technical staff - e.g. interview front-line staff dealing with customers and processing orders/interacting with users. This group often hold information that is not formally recorded

QUESTION SIX

Using the following table of data, in terms of the RELATIONAL model of data, give reasons why this table is designed badly.

Employee ID	Gender	Monthly Salary	Annual Salary	Department ID	Current Department	Date Started
M5746	Male	2,000	24000	1, 10	SocH, D.S.S	June 5
	Female	1,501	18,012	1	SocH	6/6/99
M3253		23092.45		Left July 4		6/6/99
F2031	Female	23,000		4,5,10	HRD	7/6/99
F1039	Female	20,000	1,666.67	5,10	DSS	8/6/99

Table of Data

Most candidates answered this question quite well although some candidates thought they had to go a lot further and normalise the data set. In fact the question does NOT require this, NOR does it expect candidates to simply state "the data is unnormalised" which appeared in quite a few answers followed by an explanation of normalisation.

Answer pointers:

1 mark was given for the reason and 1 for the explanation

- Row 2 : Key field with NULL value, violates entity integrity
- Rows 1,2: Redundant duplicated data Department name is redundant
- Rows 1,4,5 Repeating Group for department (a 1 to Many relationship cannot exist in a table as each cell must be single-valued)
- Columns 3,4 Derived field exists for monthly salary, creates potential inconsistency.
- Columns 4,5 Domain violations of data type and content respectively. For instance annual salary has mixed data types (character and numeric).
- Column 7: Composite data encoded in fields, the date format for a column cannot be selective within the same column as is indicated, thus June 5 could be processed differently from the composite format for the date 05/06/99

QUESTION SEVEN

Outline how a developer of a web-based information system could use the following computer languages and techniques.

a)	**Mark-up languages**	**(4 Marks)**
b)	**Client-side scripting languages**	**(4 Marks)**
c)	**The Common Gateway Interface**	**(4 Marks)**

A broad range of answers were provided. There was evidence of confusion in mark-up languages versus scripting languages. This type of question is best answered if candidates have experience of web development rather than rely on textbooks. There was little knowledge of the difference between server and client-side scripting and why this is necessary – this covered part b and part c and was intended to couple these types of scripting techniques together.

Answer pointers:

Mark-up languages include HTML/XML and are expected to be used for static information displayed via formatted text, programmed using tags and hyperlinks. Mark-ups allow a web page to be developed for running on a browser using GUI objects via HTML Forms programming.

Client-side scripting – provides programming facilities (although limited) embedded within an HTML document. Programming allows users to interact with HTML Forms (the GUI objects mentioned above) and the user interface can support dedicated functions such as rollover menus. Certain aspects of DHTML extend the functionality of HTML.

CGI. The CGI protocol allows Data to be dynamically presented in HTML on the clients browser. The CGI script runs on the server and may connect to a server-side database and present the data extracted from the database on the browser using server side scripting. The POST or GET methods of HTML are used to facilitate the passing of variables to other pages.

QUESTION EIGHT

Explain, using the keywords below as a guide, the security measures that are needed to prevent unauthorised users from reading confidential information that is available over the internet. (E.g. when goods are purchased using credit cards over the internet).

Keywords: SSL (Secure Socket Layer); Digital Signatures; Encryption
(12 Marks)

Poor knowledge was shown on this question. Many candidates got the terms mixed up or simply guessed the answer. It seems candidates had heard about these terms but had little idea how they worked.

Answer pointers:

When a browser connects to a web server using SSL the server sends the client a digital certificate which contains the server public key. The browser can authenticate the signature and if successful the public key is embedded in the certificate and used by the client to decode the information and initiate interaction/exchange of data.

Digital signatures can be used to establish the identity of an authority. Server certificates are used to identify a server as reputable; and software developers (i.e. applets are signed and thus do not corrupt information!!)

Text can be encrypted and the encryption algorithm can detect whether data has been tampered with

QUESTION NINE

The following list represents different types of computer viruses:

Trojan horse; macro; family and friends; stealth

Using the above types or others you know, describe FOUR different ways that computer viruses spread and infect computers during information exchange.
(12 Marks)

Popular question with some good answers. Most candidates were familiar with the virus types listed and did not need to introduce any of their own.

Answer pointers:

Trojan-horse - this virus masquerades as some other program or is embedded in another program

Macro - can be issued via Microsoft office documents usually attached via VBS (Vbscript) embedded in the document or passed via email. They run macro commands just as if they were active programs on the host machine.

Family and friends - this infects the address books of users and is transmitted when the address book is read and email is sent to those in the address book.

Stealth - as the name implies, it hides itself by modifying system utilities that are trying to detect it. It also effects the boot sector and makes certain virus detection routines inoperable. In a sense the virus mutates.

QUESTION TEN

Explain the differences between THREE of the following pairs of information systems terms:

a)   Inverted File and an Indexed Sequential File
b)   Object Oriented Analysis and Entity Relationship Analysis
c)   Primary Key and Foreign Key
d)   Firewall and a Sandbox   (3 x 4 Marks)

Mostly correct answers to PK and FK differences. Apart from that, poor knowledge of the differences between the remaining pairs of terms. Sandbox in particular seemed to be unknown to most candidates which was in contrast to firewall which was widely understood and known about.

Answer pointers

Inverted file differs in that the index is associated with keywords which are used to

search and place records. Whereas IS method associates every record with a KEY (unique) and access and placement is via blocks or sequences of data.

OOA involves Classes (as opposed to Entities) and thus involves behaviour (unlike ERA).
ERA maps directly to RDB whereas OO maps to program constructs used for OO programming such as properties, methods and semantic hierarchies involving inheritance.

Primary Key in a table identifies (via FD) other attributes
Foreign Key is the many side of a 1:M relationship and is posted in a table to make this association.

Firewall – is a protective layer of h/w and s/w placed around a computer installation preventing unauthorised access.
Sandbox – A term used in Java in which a protective environment is placed around a web-server running on a computer server to prevent outside access to the server programs running on the server.

QUESTION ELEVEN

a)   **Give an example of an information system that could utilise either method of user interaction given below.**   **(4 Marks)**

b)   **For each method, specify, with reasons, an example of an information system where the method of user interaction would be preferred over the other method.**   **(2 x 4 Marks)**

Method 1:   "GUI/Windows"
Where the user interacts using a mouse and a Graphical User Interface using controls such as command buttons and drop down lists.

Method 2:   "Menu Line Activations"
Where the user interacts with a text-based interface using only the keyboard Function keys and the TAB and ESCAPE keys.

Many reasonable attempts were made at this question. However candidates should use simpler illustrative examples as the examiner was looking for an understanding of the concepts of user interface design rather than esoteric contrived examples which were hard to understand without knowing the application requirements.

Answer pointers:

Example - Form-filling/data capture for a questionnaire used in an on-line survey

Method 1: A Form-filling interface which requires the user to select various options and navigate to different parts of the form (back and forth).would be better supported by Method 1 as events are activated by click events on the control or possibly by a single control such a command button.

Method 2 is better where data on a Form is fixed and entered in an orderly fashion (as it would be difficult to go back and forth). Also the data may need to be typed in and does not have the support of predefined values or defaults based on some data input context.

Question 12

Describe the characteristics of the types of files you would choose to store the following information in computer files. Your files must be portable and as the files may be made available over the WWW they must be economical in storage space.

a)   100 bit mapped images of photographs which need to be scanned at a resolution of 300 dpi (dots per inch)   (4 Marks)

b)   A collection of transparencies/OHP slides used for a lecture to university students. The OHP slides have been produced using presentation software.   (4 Marks)

c)   A script that contains commands which create and populate a database.
**   (4 Marks)**

A wide range of file types were given many of which had little bearing on the question. Some candidates misinterpreted the file types as meaning indexed sequential and serial; these are file structures and had nothing to do with the question.

Answer pointers

a)   JPEG would compress the files and a package would sort out the colour renditions and resolution where appropriate
b)   Portable options include adobe acrobat (.pdf) - here a whole document can be viewed and printed on any platform and interface (needs a free download)
c)   Text based is the only option as the SQL commands can be directly executed when used as command line arguments for a database server running the SQL interpreter.