

Computer Science IB Topic 1 - Systems in Organizations Fundamentals

1. New Systems - state and describe factors that needs to be considered when implementing a new computer system (you could use the context of SPPS Dell Learning Platform).
2. Describe compatibility issues that may result when merging software from two entities.
3. Define legacy software
4. Define Software as a Service (SAAS) and describe the advantages and disadvantages compared to hosting systems locally. Read this article <http://tinyurl.com/osxdpp9>
5. Outline the following stages of the software systems life cycle:
 - Analysis
 - Design
 - Implementation/Installation
 - Operation and maintenance
6. When implementing a new system, describe five different methods of data collection about the current situation. Include the advantages and disadvantages of each.
7. Discuss methods of testing new software systems, the importance of proper testing and the implications of inadequate testing. Then google "Iran Air flight 655".

8. Outline the following methods of implementing a new software system:

- Parallel
- Direct Changeover
- Phased Introduction

9. Define and discuss problems that may arise as a part of data migration, including: file formats, data structures, international conventions on dates, currencies and character sets.

10. Describe how an organization tests software, including: alpha, beta, user acceptance testing, debugging, automated testing, and data types.

11. Explain the features and different forms of “user documentation”

12. Describe the difference between user and system documentation.

13. Describe how an organization may train new users how to use software.

14. System Backups - describe how organizations can lose data and the consequences of data loss.

15. Describe at least three techniques that can be used to prevent an organization from data loss.

16. Explain why it isn't always a good idea to allow employees to update to the newest, latest software. Also explain how software updates are conducted.

17. Define the following components of a computer system:

- hardware
- software
- peripherals
- network

18. Describe the different roles a computer may play:

- client
- server
- email server
- DNS server
- router
- firewall

19. List the stakeholders that should be considered when planning a new system.

20. Describe methods of getting information from stakeholders while investigating a new system (include pros/cons of each):

- Survey
- interview
- direct observation

21. Draw flow chart symbols for the following operations:

- Input/Output
- Action
- Conditionals (if)
- Disk Storage
- Paper Output

22. Create a flowchart that calculates sum of numbers from 1 to N.

23. Describe the characteristics and purpose of a prototype.

24. Describe the process of iteration during the design process

25. State and describe human usability issues with common digital devices.

26. Describe the advantages and disadvantages of CLI vs. GUI

27. Outline the major stages in the software life cycle:

28. If a student record contains the following fields and there are 1400 students. How many bytes of memory must be allocated for the file?

- last name - 32 characters
- first name - 32 characters
- birthdate - 8 characters
- gender - 1 character
- phone - 16 characters

Computer Science IB Topic 2 - Computer Organization

1. Draw a sketch of the central processing unit (CPU) and describe the functions of the control unit (CU), the arithmetic and logic unit (ALU), registers, primary and secondary memory, memory address register (MAR) and memory data register (MDR).
2. Describe the difference between ROM and RAM.
3. Explain the use of cache memory and virtual memory.
4. Explain the machine instruction cycle - http://en.wikipedia.org/wiki/Instruction_cycle . Include the role of the data bus and address bus.
5. Identify the need for persistent (non-volatile) storage and provide examples.
6. Describe the main functions of an operating system.
7. Identify common features of application software (make sure to describe WIMP and GUI features).
8. Define
 - DBMS
 - IDE
 - CAD
 - CASE
 - HTML
9. Outline the meaning of the terms:

bit	Byte
Kilo	Mega
Giga	Tera
binary	denary/decimal
hexadecimal	
10. Outline the function, memory size/type and I/O for a garage door microprocessor.

11. List at list 5 components of an operating system (for example - GUI is one).

12. Describe the features of PCs, mainframes, and supercomputers. Include the following - memory, price, use, i/o devices,

13. Outline the principal characteristics of
 - Batch Processing
 - Online Processing
 - Real-time Processing

14. With two bits, what are the possible bit patterns?

15. With three bits, what are the possible bit patterns?

16. What is the mathematical relationship between the number of bits and the number of combinations?

17. If you allow 4 bits for each colour intensity – how many different colours can you create?

18. If you allow 8 bits for each colour intensity – how many different colours can you create?

19. Describe ASCII and Unicode and explain the differences between them.

20. Assume that a graphics file is displayed using a resolution of 120 pixels wide by 300 pixels high and 12 bits per pixel. Calculate the size of the graphic in terms of bits and bytes.

21. In hexadecimal, what quantities are represented by the letters A,B,E,F?

22. Convert 11011_2 to decimal (base 10) and hexadecimal

23. Convert 346_{10} to binary and hexadecimal

24. Convert $3AF_{16}$ to binary and decimal (base 10)

25. Convert the 130 to binary using the remainder method.

26. Convert 101101110110_2 to hexadecimal.

27. Apply the method of 2's complement to 010101

28. Write -34 in 8 bits using 2's complement.

29. Define the terms 'analog data' and 'digital data' and provide examples of each.

30. How many bits are required to store a RGB pixel if each pixel has a range from 0 to 255.\

31. 1001 1001 1110 0111
 AND 1100 OR 1100 NAND 0110 XOR 0110

32. Create truth tables and the symbol for AND, OR, NOT, and NOR similar to the table below
Exclusive-OR gate



A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0

33. A simple home alarm system will sound an alarm only if the system is turned on, and a door or window (or both) is open. Create a truth table for this scenario and draw the logic diagram for this system.

Computer Science IB Topic 3 - Networks

1. Define and describe the following types of networks:

LAN

WAN

WLAN

P2P

internet

VPN

VLAN

SAN

PAN

NBC

extranet

Server/Client

2. Describe the OSI seven layer model for networking.

3. Provide a list of components required to create a VPN. Why is a VPN useful to an employer.

4. Define the following network data transmission :

- data packet
- data integrity
- error checking
- flow control
- deadlock
- data switching

5. Describe networking protocols, including: data integrity, flow control, deadlock, congestion, error checking.

6. Explain why the speed of data transmission across a network can vary.

7. Explain why compression of data is often necessary when transmitting data across a network.

8. Describe each data transmission media, including speed, reliability, cost, security:

- metal conductor
- fiber optic
- wireless

9. Outline the advantages and disadvantages of wireless networks.

10. State and describe the hardware and software components required to create a wireless network.

11. Define the characteristics of wireless networks:

- WiFi
- WiMAX
- 3G mobile

14. Describe different methods of network security including the pros/cons of each:

- encryption
- userID
- trusted media access control (MAC) addresses

15. Explain how data is transmitted by packet switching.

Computer Science IB Topic 4 - Problem Solving

1. Describe a GANTT chart
2. Define preconditions and postconditions for a binary search method.
3. Define preconditions and postconditions for a bubble sort method
4. In the context of software design, describe how to implement concurrent processing.
5. Describe how abstraction is used to create a software model.
6. Describe the following algorithms:

<i>sequential search</i>	<i>binary search</i>
<i>bubble sort</i>	<i>selection sort</i>
7. Describe the use of pseudocode.
8. Describe why High Level Languages must be translated to machine executable code.
9. Explain the essential features of a computer language.
10. Describe the mod and div operators and use them with integers.

$10 \text{ MOD } 4 =$	$10/4 =$
$20\%7 =$	$105/10 =$
11. Describe a compound operation of a computer.
12. Describe the difference in efficiency between a single loop and a nest loop.
13. How you you improve the efficiency of a linear search?
14. Describe the components of a Higher Level Language
15. Describe the translation of a Higher Level Language to machine executable code.

Modelling

1. Name three different systems that can be modelled.
2. Describe the limitations of computer (mathematical) models.
3. What is a test-case, and how would you use it to evaluate a model.
4. Explain the difference between a model and a simulation.
5. Outline the software and hardware required for a simulation.
6. Discuss the reliability of a simulation by comparing generated results with data that were observed in the original problem.
7. Outline the advantages and disadvantages of simulation in a given situation rather than simply observing a real-life situation.
8. Discuss advantages and disadvantages of using a simulation for making predictions.
9. Outline the memory needs of 2D visualization
10. Identify a three-dimensional use of visualization.

Topic 7 Control Systems

1. State and describe three control systems. *For example: garage door. Inputs: force sensor, motion sensor, touch pad, remote. Outputs: motor action, warning lights, security light. This is a _____ loop system because _____.*
2. Describe four different types of input devices.
3. Describe four different types of output devices.
4. Describe how feedback is used in a garage door control system.
5. Describe the differences between an open and closed loop system.
6. Compare a centrally controlled system with a distributed system.
7. Describe the role of an autonomous agent in a control system.

Object Oriented Programming - Option D

1. Describe the difference between a class and an object.
2. Classes can create more than one object? True/False
3. String aWord; Describe aWord
4. Define instantiation
5. Google "UML diagram" and sketch an example and describe.
6. Using the process of "decomposition". Decompose a space invaders game.
7. Describe primitives and compare them to objects.
8. Describe what a parameter is in the context of a method and/or a constructor.
9. Describe encapsulation as it relates to OOP and describe its advantages.
10. Describe inheritance as it relates to Actors in Greenfoot and describe its advantages.
11. Define polymorphism as it related to OOP and describe its advantages.
12. Describe the API Library used in Greenfoot and how it makes a programmer efficient.
13. What are the disadvantages of OOP?
14. Describe modularity in the context of OOP and its advantages (include debugging, testing, team task management)

15. Define the terms:

- class, identifier
- primitive
- instance variable
- parameter
- variable
- local variable.
- method
- accessor
- mutator
- constructor
- signature
- return value
- private
- protected
- public
- extends
- static