



UCSC

University of Colombo, Sri Lanka

University of Colombo School of Computing



**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY
(EXTERNAL)**

Academic Year 2024 — 1st Year Examination — Semester 1

IT1206 — Computer Systems

Multiple Choice Question Paper
(2 Hours)

Important Instructions

- The duration of the paper is **2 Hours**.
- The medium of instructions and questions is English.
- This paper has **40 questions** on **11 pages**. Answer **all** questions.
- All questions are of the **MCQ** (Multiple Choice Questions) type.
- Each question will have **5 (five)** choices with **ONE OR MORE** correct answers.
- This paper consists of 100 marks and all the questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from -1 (All the incorrect choices are marked & no correct choices are marked) to +1 (All the correct choices are marked & no incorrect choices are marked). However, **the minimum mark per question would be zero**.
- Answers should be marked on the **special answer sheet** provided.
- Note that questions appear on both sides of the paper. If a page or part of a page is not printed, please inform the supervisor/invigilator immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**
- Any electronic device capable of storing and retrieving text, including electronic dictionaries, smartwatches, and mobile phones, is not allowed.
- Calculators are **not** allowed.
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- 1) Which of the following statements correctly match(es) computer generations with their associated technologies?
- | | | | | |
|--|--|---|--|--|
| (a) First Generation – <i>Vacuum Tubes</i> | (b) Second Generation – <i>Transistors</i> | (c) Third Generation – <i>Transistors</i> | (d) Fourth Generation – <i>Quantum Gates</i> | (e) Fourth Generation – <i>Mechanical Switch</i> |
|--|--|---|--|--|
- 2) What is/are the 8-bit two's complement representation(s) of decimal number **-128**?
- | | | |
|---------------|---------------|---------------|
| (a) 1111 1111 | (b) 0111 1111 | (c) 1011 1111 |
| (d) 1000 0000 | (e) 1000 1000 | |
- 3) What is/are the equivalent decimal value(s) of the binary number **1.1101**?
- | | | |
|------------|-----------------------|-----------|
| (a) 2.8125 | (b) 1.625 | (c) 2.625 |
| (d) 1.8125 | (e) None of the Above | |
- 4) Which of the following is/are an output device(s) of a computer?
- | | | |
|--------------|----------------|---------------------|
| (a) Keyboard | (b) Mouse | (c) Display Monitor |
| (d) Speakers | (e) Microphone | |
- 5) Which of the following is/are example(s) of **volatile storage** in a computer system?
- | | | |
|------------------|-------------------------|-----------------|
| (a) Hard Drive | (b) External Hard Drive | (c) Main Memory |
| (d) Optical Disk | (e) Cache Memory | |
- 6) Which of the following is/are the primary responsibilities of the BIOS in a computer system?
- | | | |
|------------------------|--------------------------------|-------------------|
| (a) Power-On Self-Test | (b) File System Initialization | (c) Bootstrapping |
| (d) Interrupt Handling | (e) Hardware Initialization | |
- 7) Which of the following components is/are connected to the system bus in a computer system?
- | | | |
|---------------|-----------------|---------|
| (a) BIOS | (b) RAM | (c) CPU |
| (d) Hard Disk | (e) Motherboard | |
- 8) Which of the following statements correctly describe(s) **Optical Storage Devices**?
- | |
|---|
| (a) Optical storage devices are commonly used to store data in volatile memory. |
| (b) Optical storage devices can be used to store data without power. |
| (c) Optical storage devices are typically faster than hard drives in terms of read and write. |
| (d) Flash memory is an advanced optical storage mechanism. |
| (e) Optical storage devices have higher data density than hard drives. |

9) How is data stored on a typical magnetic disk-based hard disk drive (HDD)?

- (a) Data is stored in non-volatile flash memory chips.
- (b) Data is stored using laser-etched pits and lands.
- (c) Data is stored as magnetic patterns on the surface of rotating disks.
- (d) Data is stored in the form of electrical charges in a series of flip-flops.
- (e) Data is stored in the form of electrical charges in layered capacitors.

10) Which of the following is/are **NOT** (a) component(s) of a CPU?

- | | | |
|------------------|---------------------|-----------------|
| (a) Control Unit | (b) Program Counter | (c) Main Memory |
| (d) System Clock | (e) ALU | |

11) What is/are the key concept(s) introduced by *John Von Neumann* that allowed computers to execute multiple programs without changing their physical structure?

- (a) Time-sharing technique.
- (b) Magnetic core memory.
- (c) Stored-program technique.
- (d) Multitasking architecture
- (e) Multi-threading technique.

12) What is/are the primary purpose of input/output (I/O) drivers in a computer system?

- (a) To control program flow and perform calculations and data processing.
- (b) To handle interrupts generated by input/output devices.
- (c) To provide an interface between the operating system and hardware devices.
- (d) To directly control the main memory's operation.
- (e) To bootstrap the operating system.

13) Which of the following Boolean logic statements give(s) the *Summation* output of a **Half-Adder**? (Note that Boolean logic symbols \wedge , \vee , \oplus , and \neg stand for Boolean logic operations AND, OR, XOR, and NOT respectively)

- (a) $A \wedge B$
- (b) $A \vee B$
- (c) $A \oplus B$
- (d) $\neg(A \wedge B)$
- (e) $(\neg A \wedge B) \vee (A \wedge \neg B)$

14) Which of the following techniques can improve CPU throughput?

- (a) Increasing the clock speed of the CPU.
- (b) Increasing the number of cycles per instruction.
- (c) Increasing the CPU clock cycle time.
- (d) Reducing the number of cycles per instruction.
- (e) Reducing the CPU clock cycle time.

15) Which of the following correctly describe(s) characteristic(s) or role(s) of general input/output devices in a computer system?

- (a) Touchscreens can act as both input and output devices.
- (b) Input devices are responsible for both capturing user data and processing it into machine-level instructions.
- (c) Input devices convert user actions or data into a digital form understandable by the computer.
- (d) Memory controller plays a key role in managing communication between input/output devices and the CPU.
- (e) Input/output devices communicate with the CPU through the dedicated Input/Output bus.

16) What is/are the primary role of the motherboard in a computer system?

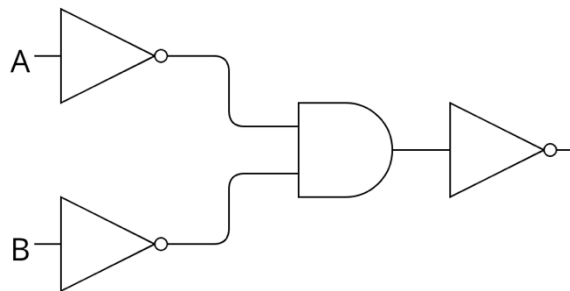
- | | | |
|------------------|---------------------------|----------------|
| (a) Power supply | (b) Component integration | (c) Networking |
| (d) Data storage | (e) Program execution | |

17) Which of the following statements accurately describe(s) cache memory and its role in computers?

- (a) Cache memory operates at a speed slower than the main memory but faster than secondary storage, providing an intermediate performance boost.
- (b) Cache memory is a small, high-speed memory that stores frequently accessed data to reduce the time required for the CPU to retrieve information.
- (c) Cache memory is a type of storage located on the hard drive, designed for quick data access by the processor.
- (d) Cache memory is used as a permanent (non-volatile) storage solution to retain data over long periods.
- (e) Typically, L1 cache is the fastest type of cache memory, positioned closest to the CPU cores, while L2 cache offers a larger capacity but slower compared to L1 cache.

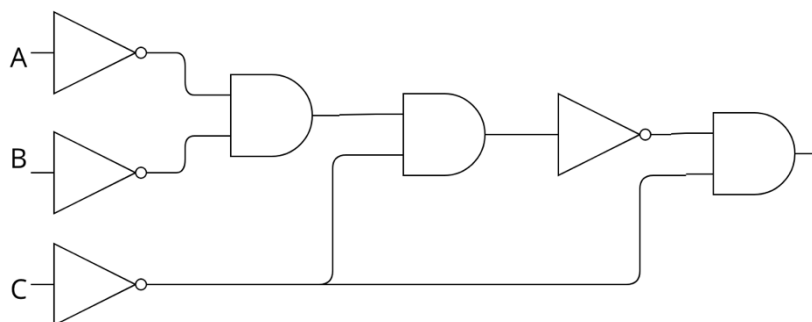
- 18) Which tool(s) is/are specifically designed to discharge static electricity from hands, clothes, tools, or components during computer maintenance?
- | |
|--|
| (a) Surge protector rod (Lightning rod)
(b) Screwdriver with insulated handle
(c) Volt-Ohm Meter (VOM) or Multimeter
(d) Thermal paste applicator
(e) Electrostatic discharger (Anti-static wrist strap) |
|--|
- 19) What is/are the purpose(s) of diagnostic software in computer troubleshooting?
- | |
|---|
| (a) To repair damaged hardware components and restore system functionality.
(b) To scan and detect hardware and software issues for effective troubleshooting.
(c) To ensure the system is running the latest driver and firmware updates.
(d) To improve overall performance by removing temporary files and optimizing resources.
(e) To prevent security breaches by identifying and neutralizing potential malware threats. |
|---|
- 20) Which type of monitor(s) use(s) liquid crystals and a backlight to display images?
- | | | |
|----------|------------|---------|
| (a) CRT | (b) LED | (c) LCD |
| (d) OLED | (e) Plasma | |
- 21) What is/are the 8-bit **Excess-127** representation for decimal value –126 ?
- | | | |
|---------------|---------------|---------------|
| (a) 1000 0010 | (b) 1111 1111 | (c) 0111 1110 |
| (d) 0000 0010 | (e) 0000 0001 | |
- 22) Which of the following expansion cards is/are primarily responsible for enhancing a computer's ability to process and render high-quality video and 3D graphics?
- | |
|---|
| (a) Sound Card
(b) Network Card
(c) VGA Card
(d) USB Card
(e) TV and video capture card |
|---|
- 23) Which of the following motherboard interfaces is/are used to connect high-speed graphics cards?
- | |
|---|
| (a) Peripheral Component Interconnect (PCI)
(b) Peripheral Component Interconnect Express (PCIe)
(c) Serial Advanced Technology Attachment (SATA)
(d) Integrated Drive Electronics (IDE)
(e) Video Graphics Accelerator Express (VGA-E) |
|---|

- 24) What is/are the equivalent logic gate(s) for the following logic circuit?



- | | | |
|--------------|--------------|--------------|
| (a) AND gate | (b) OR gate | (c) XOR gate |
| (d) NAND | (e) NOR Gate | |

- 25) What is/ are the possible output(s) of the following circuit given the inputs A, B, and C as in the following diagram?



- | | | |
|---|---|---|
| (a) $A \cdot B \cdot C$ | (b) $(A \cdot B \cdot C) \cdot \bar{C}$ | (c) $A \cdot \bar{C} + B \cdot \bar{C}$ |
| (d) $(\bar{A} \cdot \bar{B} \cdot \bar{C}) \cdot \bar{C}$ | (e) $(A + B + C) \cdot \bar{C}$ | |

- 26) The following is the incomplete truth table of the **Half Adder**. What are the appropriate truth values for A, B, C, and D in the truth table?

Input 1	Input 2	Sum	Carry Out
0	0	0	0
0	1	1	0
1	0	A	B
1	1	C	D

- | |
|------------------------|
| (a) A=0, B=1, C=1, D=0 |
| (b) A=1, B=0, C=0, D=1 |
| (c) A=1, B=1, C=1, D=0 |
| (d) A=1, B=1, C=0, D=1 |
| (e) A=0, B=1, C=1, D=1 |

27) Which of the following is/are **NOT** a primary function(s) of an operating system?

- (a) Managing hardware resources such as CPU, memory, and I/O devices
- (b) Providing a user interface for interaction
- (c) Running and scheduling application programs
- (d) Testing hardware functionality during startup.
- (e) Managing files and directories in the storage system

28) Which of the following statements is/ are accurate regarding different varieties of operating systems?

- (a) Windows is primarily open-source, while Mac OS is closed-source.
- (b) Unix is a proprietary operating system, whereas Linux is its open-source derivative.
- (c) Linux distributions are not suitable for server environments.
- (d) Mac OS is exclusively designed for Apple's hardware platforms.
- (e) Windows operating systems do not support multitasking.

29) Which of the following statements accurately describe(s) the role of the Instruction Set Architecture (ISA) of a CPU?

- (a) ISA determines the physical size and layout of the CPU.
- (b) ISA defines the set of instructions that the CPU can execute.
- (c) ISA handles the thermal management of the processor.
- (d) ISA specifies how the CPU interacts with the motherboard components.
- (e) ISA determines the operating temperature range of the CPU.

30) Which of the following CPU instructions demonstrate(s) *immediate addressing mode*?
(Note: In the context, **R1**, **R2**, and **R3** are CPU registers, and the hash symbol (#) denotes a constant value in machine language. The instructions **MOV**, **ADD**, and **SUB** represent data transfer, addition, and subtraction operations, respectively.)

- (a) MOV R1, #25
- (b) MOV R1, R2
- (c) ADD R1, R2, R3
- (d) SUB R1, #10
- (e) SUB R1, R2, R3

31) What is/are the primary purpose(s) of a utility program in a computer system?

- (a) To provide an interface for user applications.
- (b) To perform tasks that help maintain or optimize the system.
- (c) To create and edit multimedia content.
- (d) To configure operating system and maintain the operating system kernel.
- (e) To install and update software applications.

32) Which of the following correctly describe(s) the characteristics of data communication media?

- (a) Twisted-pair cables are typically used for long-distance communication, offer high bandwidth, and are immune to electromagnetic interference.
- (b) Coaxial cables consist of a central core of glass fibers, offer very high data rates, and are less prone to signal degradation over long distances.
- (c) Fiber-optic cables use a central copper conductor and are commonly used for short-distance communications due to their low cost.
- (d) Twisted-pair cables are the most common form of wired communication and are susceptible to electromagnetic interference but are relatively inexpensive.
- (e) Coaxial cables are immune to electromagnetic interference and typically have lower data rates compared to twisted-pair cables and fiber-optic cables.

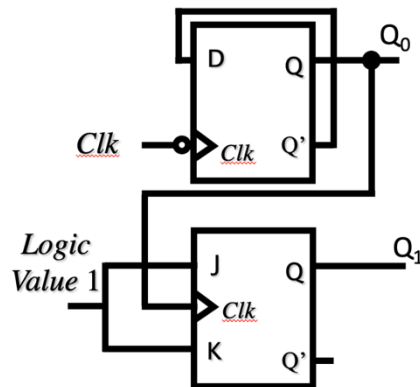
33) Which of the following statements accurately describe(s) the functions and characteristics of common network devices?

- (a) A Network Interface Card of a personal computer is for finding the optimal path to the destination.
- (b) A modem converts digital signals from a computer into analog signals for transmission over telephone lines and vice versa, allowing the Internet connectivity.
- (c) A network hub is a more intelligent device than a network switch and can manage traffic between devices to improve network efficiency.
- (d) A network switch operates at the data link layer, forwarding data frames based on MAC addresses, and helps reduce network collisions by segmenting traffic.
- (e) A router is used to interconnect devices within the same local network and does not operate between different networks or subnetworks.

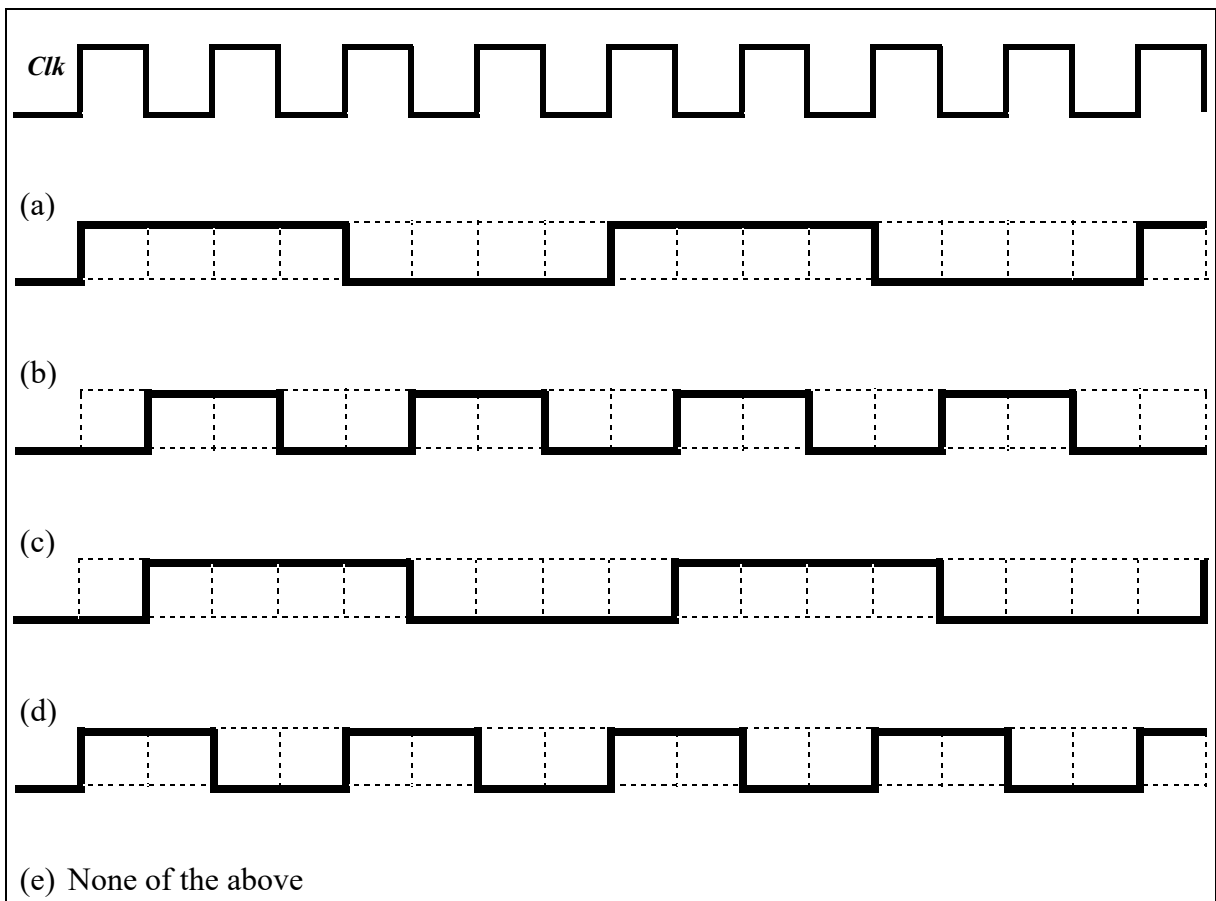
34) Which of the following is/are a/the simplified expression(s) of the Boolean algebraic expression $(A + B) \cdot (\bar{A} + C) \cdot (\bar{B} + \bar{C})$?

- | | |
|---|---|
| (a) $A \cdot \bar{B} \cdot C + \bar{A} \cdot B \cdot \bar{C}$ | (b) $\bar{A} \cdot B + A \cdot \bar{B} \cdot \bar{C}$ |
| (c) $A \cdot B \cdot C + \bar{A} \cdot \bar{B} \cdot \bar{C}$ | (d) $A \cdot B \cdot C + B \cdot \bar{C}$ |
| (e) $\bar{B} \cdot C + A \cdot \bar{C}$ | |

- 35) Consider the sequential logic circuit given below, which consists of a **negative edge triggered** D Flip Flop and a **positive edge triggered** J-K Flip Flop. The clock input is given as '*Clk*' in the diagram.



Assuming both Q_0 and Q_1 are logic value zero (0) at the beginning, which of the following time diagram(s) depict(s) the behaviour of Q_1 correctly for the given Clock (*Clk*) sequence?



- 36) What is/are the corresponding decimal value of **IEEE 754 single precision** floating point number **00111101111000000000000000000000**?

(a) 28.0	(b) 0.109375	(c) 0.1171875
(d) 24.0	(e) 0.09375	

37) What is the decimal number represented by the 8-bit two's complement number 10111101?

- | | | |
|---------|---------|---------|
| (a) -61 | (b) -64 | (c) -66 |
| (d) -67 | (e) -68 | |

38) What is the **minimum** number of NAND gates required to implement the following Boolean expression using **only** NAND gates?

$$\overline{(A + B)} + (B.C)$$

- | | | |
|-------|-------|-------|
| (a) 4 | (b) 5 | (c) 6 |
| (d) 7 | (e) 8 | |

39) When the following machine instruction code is executed in a computer, what are the corresponding values stored in registers R2 and R3 respectively at the time of the final instruction is being executed?

Note: Interpretations of the machine instructions are as given here. All the numbers given in the machine code are in decimal representation.

- **LI R, A** Load the register R with hexadecimal value A.
- **SUB R1, R2, R3** Subtract the numeric values in R2 from R3 and place the results in R1.
- **DEC R** Decreases the value of register R by one.
- **JMP L, R** Jump to the label L if the bit pattern in R is none zero.
- **LABEL_#:** Used as a jump target in the instruction which refers to a location in the assembly code.

```
LI R2, 0x05
LI R3, 0x09
LABEL:
SUB R1, R2, R3
DEC R3
JMP LABEL, R1
DEC R2
LI R3, 0x35
```

- | | | |
|----------|----------|----------|
| (a) 0, 5 | (b) 5, 0 | (c) 4, 5 |
| (d) 5, 4 | (e) 4, 0 | |

- 40) What is/are the simplified Boolean algebraic expression(s) that can be derived through the following Karnaugh Map by applying appropriate grouping rules?

		A.B			
		00	01	11	10
C.D	00	1	0	1	1
	01	0	0	1	0
	11	0	0	1	0
	10	1	0	1	1

(a) $(A + \bar{B}) + (B + \bar{D})$

(b) $(\bar{A} + B).(\bar{B} + D)$

(c) $A.B + \bar{B}.\bar{D}$

(d) $(A + \bar{B}).(B + \bar{D})$

(e) $(A + \bar{B}).(A + \bar{D})$
