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University Examinations 2024/2025

THIRD YEAR FIRST SEMESTER FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SECURITY AND FORENSICS

CCF 3302: OPERATING SYSTEMS DESIGN AND SECURITY

DATE: JANUARY 2025   **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **ONE** (Compulsory) and any other **TWO** questions*

QUESTION ONE (30 MARKS)

a) Define the following terms as used in operating systems design and security

i.	Operating system	(1 mark)
ii.	Device driver	(1 mark)
iii.	OS Kernel	(1 mark)
iv.	Virtualization	(1 mark)

b) Discuss how paging help in managing memory   (3 marks)

c) Using examples, explain the role of peripheral devices in a computer system   (5 marks)

d) Explain the key stages involved in bootstrapping process, and the role the bootloader plays in this process   (5 marks)

e) Explain the basic taxonomy of any THREE categories of malware   (3 marks)

f) Describe three common types of security threats that can affect computer operating systems
                                                                         (5 marks)

g) Explain three basic operating system security mechanisms that help protect a system from security threats   (5 marks)

QUESTION TWO (20 MARKS)

a) Discuss the considerations should be taken into account during the installation process

(5 marks)

b) Compare and contrast RISC (Reduced Instruction Set Computer) and CISC (Complex Instruction Set Computer) architectures, highlighting their advantages and disadvantages.

(5 marks)

c) Discuss the differences between virtual memory and physical memory. (5 marks)

d) Discuss how paging is implemented in different computer architectures, highlighting differences between paging in x86 and ARM architectures (5 marks)

QUESTION THREE (20 MARKS)

a) Explain the function of I/O ports and buses in connecting peripheral devices to a computer

(5 marks)

b) Describe the role of device drivers in the operating system. (5 marks)

c) Describe the process of communication between a peripheral device and the operating system, including the role of interrupts in this process (5 marks)

d) Discuss the impact of I/O system design on overall system performance (5 marks)

QUESTION FOUR (20 MARKS)

a) Compare and contrast BIOS and UEFI in terms of their functionality, architecture, and capabilities and how they differ in managing the boot process (5 marks)

b) Explain the concept of interrupt handling mechanisms in a computer system (5 marks)

c) Describe the concepts of user authentication and access control in an operating system

(5 marks)

d) Discuss three secure OS design principles that should be considered when developing or evaluating an operating system (5 marks)

QUESTION FIVE (20 MARKS)

a) Discuss the key differences between viruses and worms including their propagation methods and effects on systems. (5 marks)

b) Describe at least two techniques used by rootkits to conceal their presence on a system.

(5 marks)

c) Discuss three key security considerations in virtualization and how these considerations impact the overall security of a virtualized environment   (5 marks)

d) Identify and describe three types of virtualization technology providing example of an application or use case for each type   (5 marks)