CS222 · OPERATING SYSTEMS

Final Practice

Each past model as its own mock exam · 451 · 452 · 461 · 462 · 471

محارب

Model 451 — Dr. Al-Amro

5 MCQ · 5 T/F · 2 problems · written

Section A — Multiple Choice (5)

01 MCQ **A table that defines access permissions between specific subjects and objects:**

- A Stack Inspection
- B Role-Based Access Control
- C Access Matrix
- D Protection

02 MCQ **Which of the following comes in different sizes?**

- A Program pages
- B Program segments
- C Program frames
- D All of the answers

03 MCQ **Intruder sits in data flow, masquerading as sender to receiver and vice versa:**

- A Masquerading
- B Breach of integrity
- C Man-in-the-middle attack
- D Session hijacking

04 MCQ **An abstract hardware of a single computer into several different execution environments:**

- A Virtual machine
- B Live migration
- C Cloud computing
- D NAT

05 MCQ **Unauthorized modification of data leads to:**

- A Breach of confidentiality
- B Breach of integrity
- C Breach of availability
- D Denial of service

Section B — True / False (5)

06 TRUE / FALSE **Each OS has its own I/O subsystem structures and driver frameworks.**

True ☐ False ☐

07 TRUE / FALSE **Binary semaphore contains an integer value that can range over an unrestricted domain.**

True ☐ False ☐

08 TRUE / FALSE **A port scanning is a program that initiates a security incident under certain circumstances.**

True ☐ False ☐

09 TRUE / FALSE **Block and stack methods limit the number or length of parameters being passed.**

True ☐ False ☐

10 TRUE / FALSE **System is secure if resources are used and accessed as intended under all circumstances.**

True ☐ False ☐

Section C — Problems

11 PROBLEM SJF Non-Preemptive · 6 marks

Non-Preemptive SJF, all arrive at 0. Draw the Gantt chart and find avg waiting time. P1=21, P2=3, P3=6, P4=2

Fill the Gantt chart above · show waiting-time work on the lines below

12 PROBLEM `First/Best/Worst Fit · 6 marks`

Allocate P1 = 5KB. Mark its location for each method.

First fit

4	6	3	11	2	5	18	14

Best fit

4	6	3	11	2	5	18	14

Worst fit

4	6	3	11	2	5	18	14

Section D — Written

13 WRITTEN `Directory · LIST`

List five operations performed on a Directory.

14 WRITTEN `DEFINE`

Define both Protection and Security.

15 WRITTEN `CIA · LIST`

List the five Security Violation Categories.

— ANSWER KEY —

01 — **C) Access Matrix**.

02 — **B) Program segments**.

03 — **C) Man-in-the-middle attack**.

04 — **A) Virtual machine**.

05 — **B) Breach of integrity**.

06 — **TRUE**.

07 — **FALSE** — Binary is 0/1.

08 — **FALSE** — Trap door / Logic bomb.

09 — **FALSE**.

10 — **TRUE** by definition.

11 — Order P4→P2→P3→P1.

```
Gantt: |P4|P2|P3|  P1  |
0   2   5  11        32
W: P4=0,P2=2,P3=5,P1=11
Avg=(0+2+5+11)/4 = 4.5
```

12 — **First=6kb · Best=5kb · Worst=18kb**.

13 — Search · Create · Delete · List · Rename · Traverse.

14 — **Protection:** controlling access of processes/users to OS resources. **Security:** defense against internal & external attacks.

15 — Confidentiality · Integrity · Availability · Theft of service · DOS.

Model 452 — Dr. Al-Amro

5 MCQ · 5 T/F · 2 problems · written

Section A — Multiple Choice (5)

16 MCQ **A table that defines access permissions between specific subjects and objects:**

- A Stack Inspection
- B Role-Based Access Control
- C Access Matrix
- D Protection

17 MCQ **Which of the following comes in different sizes?**

- A Program segments
- B Program pages
- C Program frames
- D All of the answers

18 MCQ **Intruder sits in data flow, masquerading as sender to receiver and vice versa:**

- A Session hijacking
- B Replay attack
- C Man-in-the-middle attack
- D Masquerading

19 MCQ **An abstract hardware of a single computer into several different execution environments:**

- A Virtual machine
- B Live migration
- C Cloud computing
- D NAT

20 MCQ **Unauthorized modification of data leads to:**

- A Breach of confidentiality
- B Breach of integrity
- C Breach of availability
- D Denial of service

Section B — True / False (5)

21 TRUE / FALSE **Program must be brought from disk into memory and placed within a process for it to be run.**

True ☐ False ☐

22 TRUE / FALSE **A port scanning is a program that initiates a security incident under certain circumstances.**

True ☐ False ☐

23 TRUE / FALSE **Binary semaphore contains an integer value that can range over an unrestricted domain.**

True ☐ False ☐

24 TRUE / FALSE **Block and stack methods limit the number or length of parameters being passed.**

True ☐ False ☐

25 TRUE / FALSE **Each OS has its own I/O subsystem structures and device driver frameworks.**

True ☐ False ☐

Section C — Problems

26 PROBLEM `Non-Preemptive Priority · 6 marks`

Non-Preemptive Priority, all arrive at 0. Draw Gantt and find avg waiting time. `P1: b21 prio4 | P2: b3 prio2 | P3: b6 prio3 | P4: b2 prio1`

Fill the Gantt chart above · show waiting-time work on the lines below

27 PROBLEM `First/Best/Worst Fit · 6 marks`

Allocate P1 = 5KB. Mark its location for each method.

First fit

4	6	3	11	2	5	18	14

Best fit

4	6	3	11	2	5	18	14

Worst fit

4	6	3	11	2	5	18	14

Section D — Written

28 WRITTEN `Directory · LIST`

List five operations performed on a Directory.

29 WRITTEN DIFFERENCE

Explain the difference between Logical and Physical Address Space.

30 WRITTEN LEAST PRIVILEGE

Explain the principle of least privilege in Protection.

31 WRITTEN CIA · LIST

List five Security Violation Categories.

— ANSWER KEY —

16 — **C) Access Matrix**.

17 — **A) Program segments**.

18 — **C) Man-in-the-middle attack**.

19 — **A) Virtual machine**.

20 — **B) Breach of integrity**.

21 — **TRUE**.

22 — **FALSE** — Trap door / Logic bomb.

23 — **FALSE**.

24 — **FALSE**.

25 — **TRUE**.

26 — Lower number = higher priority. Order P4→P2→P3→P1.

```
Gantt: |P4|P2|P3|  P1  |
0   2   5  11        32
W: P4=0,P2=2,P3=5,P1=11
Avg=(0+2+5+11)/4 = 4.5
```

27 — **First=6kb · Best=5kb · Worst=18kb**.

28 — Search · Create · Delete · List · Rename · Traverse.

29 — Logical=generated by CPU (virtual); Physical=seen by memory unit. compile/load time identical, execution time differ (MMU).

30 — Grant minimum privileges to perform a task; limits damage; static or dynamic.

31 — Confidentiality · Integrity · Availability · Theft of service · DOS.

Model 461

5 T/F · 5 MCQ · 2 problems · written | question types taken from the marked slides (list / difference / T-F)

Section A — True / False

32 TRUE / FALSE **Even single-CPU systems act like multiprocessor ones when virtualized.**

True ☐ False ☐

33 TRUE / FALSE **Multilevel page table reduces memory usage.**

True ☐ False ☐

34 TRUE / FALSE **The user program deals with logical addresses and never sees the real physical addresses.**

True ☐ False ☐

35 TRUE / FALSE **Anomaly detection has no false positives or false negatives.**

True ☐ False ☐

36 TRUE / FALSE **Register access is slower than main memory access.**

True ☐ False ☐

Section B — Multiple Choice

37 MCQ **The MMU is a hardware device that maps:**

A physical to logical

B virtual to physical

C disk to cache

D page to segment

38 MCQ **The simplest way to pass parameters to the OS is through:**

A the stack

B a block in memory

C registers

D a file

39 MCQ **VMM software that runs directly on hardware (bare-metal) is:**

- A Type 2 hypervisor
- B Type 1 hypervisor
- C Emulator
- D Containment

40 MCQ **Which detection method can catch zero-day attacks?**

- A Signature-based
- B Anomaly (behavior) detection
- C Port scanning
- D Auditing

41 MCQ **Defense in depth means:**

- A a single strong firewall
- B multiple layers of security
- C encrypting one file
- D disabling all ports

Section C — Problems

42 PROBLEM `SRTF · 5 marks`

Shortest-Remaining-Time-First (preemptive). Draw Gantt and find avg waiting time. `P1: b20 a1 | P2: b2 a0 | P3: b6 a4 | P4: b2 a6`

Fill the Gantt chart above · show waiting-time work on the lines below

43 PROBLEM `First/Best/Worst Fit · 6 marks`

Allocate P1 = 5KB. Mark its location for each method.

First fit

4	6	3	11	2	5	16	14

Best fit

4	6	3	11	2	5	16	14

Worst fit

4	6	3	11	2	5	16	14

Section D — Written

44 WRITTEN `PCB · LIST`

List the information stored in a Process Control Block (PCB).

45 WRITTEN `Criteria · LIST`

List the Scheduling Criteria.

46 WRITTEN `Optimization · LIST`

List the Scheduling Algorithm Optimization Criteria.

47 WRITTEN `DIFFERENCE`

Explain the difference between Protection and Security.

48 WRITTEN `Distributed · LIST`

List the Reasons for Distributed Systems.

49 WRITTEN `DIFFERENCE · Key`

What is the difference between Signature-based and Anomaly (behavior) detection?

— ANSWER KEY —

32 — **TRUE**.

33 — **TRUE**.

34 — **TRUE**.

35 — **FALSE** — both are a problem.

36 — **FALSE** — registers are faster.

37 — **B) virtual to physical**.

38 — **C) registers**.

39 — **B) Type 1 hypervisor**.

40 — **B) Anomaly detection**.

41 — **B) multiple layers of security**.

42 — Preempt for shortest remaining at each arrival.

```
Gantt: |P2|P1|P3|P4|P3|  P1  |
0  2  4  6  8 12      29
W=(finish-arr)-burst:
P1=8,P2=0,P3=2,P4=0
Avg=(8+0+2+0)/4 = 2.5
```

43 — **First=6kb · Best=5kb · Worst=16kb**.

44 — Process state · Program counter · CPU registers · Scheduling info · Memory-mgmt info · Accounting · I/O status.

45 — CPU utilization · Throughput · Turnaround · Waiting · Response time.

46 — Max CPU utilization · Max throughput · Min turnaround · Min waiting · Min response.

47 — Protection=controlling access to OS resources; Security=defense against internal & external attacks.

48 — Resource sharing · Computation speedup · Reliability · Communication.

49 — Signature=known bad patterns; Anomaly=deviations from normal behavior, detects zero-day.

Model 462

5 MCQ · 5 T/F · 2 problems · written (essay-heavy) | from the collection + marked slides

Section A — Multiple Choice (10 marks)

50 MCQ **Technique in which the guest OS is modified to cooperate with the VMM to optimize performance:**

- A Emulation
- B Paravirtualization
- C Application containment
- D Live migration

51 MCQ **Intruder sits in data flow, masquerading as sender to receiver and vice versa:**

- A Masquerading
- B Man-in-the-middle attack
- C Replay attack
- D Session hijacking

52 MCQ **Each IP address has a corresponding:**

- A DNS name
- B Media Access Control (MAC) address
- C port number
- D subnet mask

53 MCQ **The simplest way to pass parameters to the OS is through:**

- A the stack
- B registers
- C a block in memory
- D a file

54 MCQ **A network designed to cover a small geographical area:**

- A WAN
- B MAN
- C LAN
- D VPN

Section B — True / False (5)

55 TRUE / FALSE **System is secure if resources are used and accessed as intended under all circumstances.**

True ☐ False ☐

56 TRUE / FALSE **Logical address can access / locate the physical address directly without the need of MMU.**

True ☐ False ☐

57 TRUE / FALSE **PROCESS must be brought from disk into memory.**

True ☐ False ☐

58 TRUE / FALSE **Multilevel page table reduces memory usage.**

True ☐ False ☐

59 TRUE / FALSE **All OS have the same I/O sub-system.**

True ☐ False ☐

Section C — Problems

60 PROBLEM `SJF Non-Preemptive · marks`

Non-Preemptive SJF. Draw the Gantt chart and find avg waiting time. `P2: b12 a0 | P3: b8 a3 | P4: b4 a5 | P1: b10 a10 | P5: b6 a12`

Fill the Gantt chart above · show waiting-time work on the lines below

61 PROBLEM `Best / Worst Fit · marks`

Allocate P1 = 5KB. Mark its location (Best & Worst fit emphasized).

First fit

4	6	3	11	2	5	16	14

Best fit

4	6	3	11	2	5	16	14

Worst fit

4	6	3	11	2	5	16	14

Section D — Written

62 WRITTEN `DIFFERENCE · Key`

Explain the difference between Protection and Security.

63 WRITTEN LEAST PRIVILEGE

Explain the principle of least privilege.

64 WRITTEN I/O · LIST

List five ways to improve I/O performance.

65 WRITTEN CIA · LIST + example

List the five Security Violation Categories with an example of each.

66 WRITTEN DIFFERENCE

What is the difference between Signature-based and Behaviour-based detection?

67 WRITTEN MMU · DEFINE

Define the Memory-Management Unit (MMU). (3 marks)

— ANSWER KEY —

50 — **B) Paravirtualization**.

51 — **B) Man-in-the-middle attack**.

52 — **B) MAC address**.

53 — **B) registers**.

54 — **C) LAN**.

55 — **TRUE**.

56 — **FALSE**.

57 — **TRUE**.

58 — **TRUE**.

59 — **FALSE**.

60 — Pick shortest available burst each time.

```
Gantt: |P2|P4|P5|P3|  P1  |
0  12 16 22 30        40
W=start-arrival:
P1=20,P2=0,P3=19,P4=7,P5=4
Avg=(20+0+19+7+4)/5 = 10
```

61 — **First=6kb · Best=5kb · Worst=16kb**.

62 — Protection=controlling access to OS resources; Security=defense against internal & external attacks.

63 — Grant minimum privileges needed; limits damage; static or dynamic.

64 — Reduce context switches · Reduce data copying · Reduce interrupts · Use DMA · Smarter hardware.

65 — Confidentiality (reading data) · Integrity (modifying data) · Availability (destroying data) · Theft of service (using resources) · DOS (blocking legitimate use).

66 — Signature=known bad patterns; Behaviour=deviations from normal, detects zero-day.

67 — Hardware mapping logical→physical via relocation register; program sees logical only.

Model 471

5 T/F · 5 MCQ · 2 problems · written

Section A — True / False (5)

68 TRUE / FALSE **Program must be brought from disk into memory and placed within a process for it to be run.**

True ☐ False ☐

69 TRUE / FALSE **Fault tolerance — the distributed system should continue to function in the face of failure.**

True ☐ False ☐

70 TRUE / FALSE **Live migration — move a running VM from one host to another with no interruption of user access.**

True ☐ False ☐

71 TRUE / FALSE **Multilevel page table increases page table size in memory.**

True ☐ False ☐

72 TRUE / FALSE **Debugging creates and introduces errors and bugs to the system.**

True ☐ False ☐

Section B — Multiple Choice (5)

73 MCQ **Every host has a unique IP address and a corresponding:**

- A DNS name
- B Media Access Control (MAC) address
- C port number
- D gateway

74 MCQ **The network used in public institutions such as libraries and schools:**

- A WAN
- B LAN (local)
- C MAN
- D VPN

75 MCQ **One advantage of the Microkernel structure is:**

- A faster system calls
- B easier to extend a microkernel
- C direct hardware access
- D larger kernel

76 MCQ **A reason for Distributed Systems:**

- A Resource sharing
- B Context switching
- C Memory paging
- D Compilation

77 MCQ **Technique in which the guest OS is modified to work with the VMM to optimize performance:**

- A Emulation
- B Paravirtualization
- C Containment
- D NAT

Section C — Problems

78 PROBLEM `Round Robin · 6 marks`

Round Robin with quantum Q=4 (all arrive at 0). Draw Gantt and find avg waiting time. `P0=12, P1=5, P2=9, P3=7`

Fill the Gantt chart above · show waiting-time work on the lines below

79 PROBLEM `First/Best/Worst Fit · 6 marks`

Allocate P1 = 5KB. Mark its location for each method.

First fit

4	6	3	11	2	5	16	14

Best fit

4	6	3	11	2	5	16	14

Worst fit

4	6	3	11	2	5	16	14

Section D — Written (new essays)

80 WRITTEN `Cache`

Explain the cache-consistency problem in a DFS and how consistency is maintained.

81 WRITTEN `File Ops · LIST`

List the basic file operations and briefly describe each.

82 WRITTEN `Access Matrix · LIST`

List the methods used to implement the access matrix.

83 WRITTEN `Migration`

Explain process migration in distributed OS and its advantages.

— ANSWER KEY —

68 — **TRUE**.

69 — **TRUE**.

70 — **TRUE**.

71 — **FALSE** — it reduces memory usage.

72 — **FALSE** — debugging fixes errors.

73 — **B) MAC address**.

74 — **B) LAN (local)**.

75 — **B) easier to extend a microkernel**.

76 — **A) Resource sharing**.

77 — **B) Paravirtualization**.

78 — Rotate with quantum 4; sum gaps.

```
|P0|P1|P2|P3|P0|P1|P2|P3|P0|P2|
0  4  8 12 16 20 21 25 28 32 33
P0=20,P1=16,P2=24,P3=21
Avg=81/4 = 20.25
```

79 — **First=6kb · Best=5kb · Worst=16kb**.

80 — Keep cached copies = master. Client-initiated (client validates) & Server-initiated (server tracks/reacts).

81 — Create · Write · Read · Reposition · Delete · Truncate · Open/Close.

82 — Global table · Access lists for objects · Capability list for domains · Lock-key.

83 — Load balancing · Computation speedup · Hardware preference · Software preference · Data access.