

The Open University of Sri Lanka  
Faculty of Engineering Technology  
Department of Electrical and Computer Engineering



Study Programme : Bachelor of Science Honours in Engineering  
Name of the Examination : Final Examination  
**Course Code and Title : EEX5335 Operating Systems**  
Academic Year : 2024/25  
Date : 29<sup>th</sup> January 2026  
Time : 1330-1630h  
Duration : 3 hours

### General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Five (5)** questions in **Three (3)** pages.
3. Answer **all** questions.
4. All questions carry equal marks.
5. Answer for each question should commence from a new page.
6. This is a Closed Book Test (CBT).

### Question 01 [20 Marks]

- a. Explain the concept of **paging** in operating systems. Clearly describe why paging is used.  
[06 Marks]
- b. Define **virtual memory**. Explain how virtual memory improves system performance and supports multiprogramming using two examples.  
[06 Marks]
- c. What is a **page table**? Explain its role in logical to physical address translation with a neat diagram.  
[08 Marks]

### Question 02 [20 Marks]

- a. Define **deadlock**. Name four necessary conditions for deadlock to occur.  
[06 Marks]
- b. The following sequence of events occurred when allocating multiple resources to execute several processes in a multiprogramming operating system. Here, "**P**" represents a process and "**R**" represents a resource.
  - i. Draw Resource Allocation Graph using Holt's deadlock modeling method to analyze the system behavior. Use following detailed **table Q02**.  
[12 Marks]

**Table Q2: Resource Allocation Events**

| Event | Action                        |
|-------|-------------------------------|
| 1     | P1 requests and gets R2       |
| 2     | P2 requests and gets R1       |
| 3     | P3 requests and gets R4       |
| 4     | P1 requests R1                |
| 5     | P2 requests R3                |
| 6     | P4 requests and gets R3       |
| 7     | P3 requests R2                |
| 8     | P4 requests R4                |
| 9     | P2 releases R1 and P1 gets R1 |
| 10    | P1 requests R4                |

- ii. At the end of Event 10, **is the system deadlocked as a whole?** Justify your answer clearly using the above graph.

[02 Marks]

**Question 03 [20 Marks]**

- a. Briefly explain two purposes of **CPU scheduling** in an operating system.

[04 Marks]

- b. Describe the following scheduling algorithms,

i. First Come First Serve (FCFS)

ii. Shortest Job First (SJF)

iii. Round Robin (RR)

[06 Marks]

**Table Q3: Process Timing**

| Process | Arrival Time | Burst Time |
|---------|--------------|------------|
| P1      | 0            | 5          |
| P2      | 1            | 3          |
| P3      | 2            | 8          |
| P4      | 3            | 6          |

- c. Using **Table Q03**,

- i. Draw the **Gantt chart** using FCFS scheduling.

[06 Marks]

- ii. Calculate the **completion time** of each process.

[04 Marks]

**Question 04 [20 Marks]**

- a. Explain following terms briefly,

i. Turnaround Time

ii. Waiting Time

iii. Response Time

[06 Marks]

- b. Using **Table Q3**, calculate

i. Turnaround Time for each process

ii. Waiting Time for each process

[08 Marks]

- c. Explain following terms briefly,
  - i. Priority-based scheduling
  - ii. Starvation
  - iii. Aging in process scheduling

[06 Marks]

**Question 05 [20 Marks]**

- a. Explain four operating system security mechanisms used to protect system resources and data.

[08 Marks]

- b. What is a **Virtual Machine (VM)**? Explain how virtualization works with the help of a simple diagram.

[06 Marks]

- c. State two advantages and two disadvantages of using virtual machines in modern operating systems.

[06 Marks]

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