

University of Ruhuna- Faculty of Technology
Bachelor of Information Communication Technology Honours Degree
Level 2 (Semester II) Examination, November 2023
Academic year 2021/2022

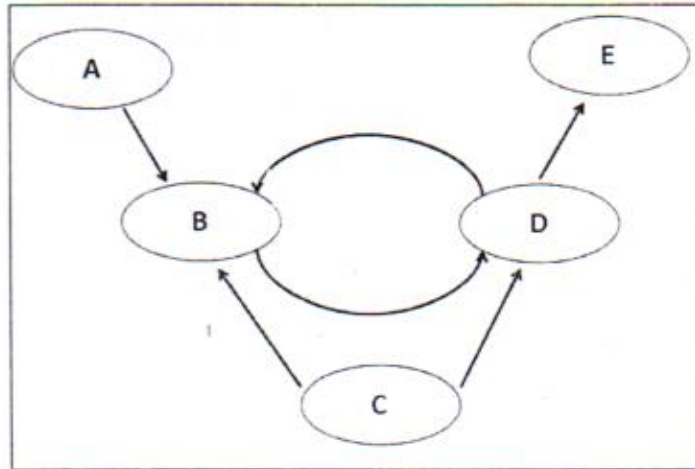
Course Unit: ICT2213 Operating System Concepts and Applications (Theory)
Duration: 2 hours

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IMPORTANT INSTRUCTIONS

- This is a Closed Book examination.
- The medium of this examination is English.
- This paper contains **four (04)** questions on **four (04)** pages.
- All **four (04)** questions are given equal marks.
- **Answer all four (04) questions.**

- 1)
- a) Windows XP is an example of an Operating System. What do you mean by an OS? [10 marks]
 - b) Explain the "Computer Start-up" process. [25 marks]
 - c) Differentiate between "Single-Processor Systems" and "Multiprocessor" architectures at least with one (01) difference. [20 marks]
 - d) Briefly discuss the **two (02)** types of the multiprocessor systems. [20 marks]
 - e) List **five (05)** Operating System services. [25 marks]
- 2)
- a) Briefly explain following terms. [10 marks]
 - i) Process control block
 - ii) Context switch
 - b) List **five (05)** components of a process. [25 marks]
 - c) Briefly explain "CPU Scheduler" and "Job Scheduler". [20 marks]
 - d) Explain **two (02)** methods of the inter-process communication with suitable diagrams. [20 marks]
 - e) Answer the following questions based on the given diagram.



i) Identify and name the states of a process from A to E. [10 marks]

ii) Explain **three (03)** of identified state of process. [15 marks]

2)

a) Compare and contrast the “Preemptive scheduling” and “Non-preemptive scheduling” at least with one (01) difference. [10 marks]

b) Differentiate between user threads and kernel threads. [10 marks]

c) Identify and write **one (01)** advantage and **one (01)** disadvantage of one-to-one thread model. [10 marks]

d) Briefly explain **two (02)** types of parallelism in the multicore programming. [10 marks]

e) Consider the following set of processes, with the length of the CPU burst which is given in milliseconds. Take the time quantum as 4ms when necessary. [60 marks]

Process	Burst time (ms)
A	5
B	3
C	8
D	9
E	8

- i) Draw **two (02)** Gantt charts that illustrate the execution of these processes using the following scheduling algorithms. Calculate the average response time for each algorithm mentioned below.
 - FCFS
 - Round Robin
- ii) Select the best algorithm from the above mentioned in (i) for scheduling in terms of Average Response Time. Justify your selection in brief.

4)

a) Computer memory consists of a large array of bytes and need to be allocated to the processes effectively.

i) Briefly explain the concept of address binding.

[05 marks]

iii) Briefly explain the "fixed size partitioning" and "Variable partitioning."

[10 marks]

b) List down **three (03)** of the necessary conditions for a deadlock to occur?

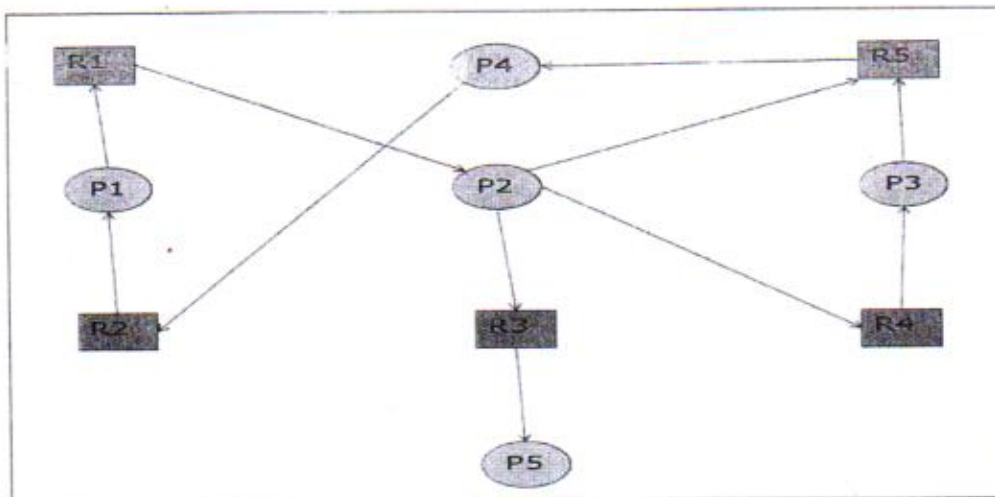
[09 marks]

c) List **three (03)** solutions to the Critical Section Problem.

[09 marks]

d) Consider the following resource allocation graph.

[15 marks]



i) Draw the corresponding Wait-for Graph.

ii) Are there any possibilities for a deadlock situation? Justify your answer.

- e) Consider the following snapshot of the system. P1, P2, P3 and P4 processes and R1, R2, R3 and R4 are resources. The following resource vector indicates the number of available instances for each resource type. [52 marks]

Process	Current Allocation				Maximum need			
	R1	R2	R3	R4	R1	R2	R3	R4
P1	4	2	1	2	5	3	2	3
P2	2	1	3	0	2	1	4	1
P3	0	2	0	1	1	2	1	1
P4	2	0	0	2	2	0	1	3

Resource vector			
R1	R2	R3	R4
9	5	5	5

- Calculate the need matrix.
- Determine the available resources.
- Find out a safe sequence. Justify your answer with steps.

-----End of the paper-----