



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

**B.Sc. (General) Degree in Information and Communication Technology
FirstYear- Semester II Examination – November/December 2016**

ICT 1308 – OPERATING SYSTEMS

Time: Three (03) hours

Answer all Questions.

Library
Faculty of Applied Sciences
Rajaratna University of Sri Lanka
Rajaratna

01.

- a. **“Exokernel systems save layer of mapping unlike in Virtual Machine systems.”** Explain this statement by differentiating in between Exokernel and Virtual Machine architectures. (4 marks)
- b. **“Operating system (OS) is a resource manager which shares the resources in computer systems by the means of time multiplexing and space multiplexing.”** Explain how OS achieves this in a multi programming environment. (4 marks)
- c. **“To improve performance, many modern CPUs have facilities for executing more than one instruction at the same time.”** Justify this statement considering the approaches of pipelining and superscalar CPU. (4 marks)
- d. What are the three file types that an operating system may need to handle? (3 marks)
- e. State three methods that can be used to improve file system performance and explain two of them. (5 marks)

(Total: 20 marks)

02.

- a. State the 3 main states a process can be in. Explain with examples how the transitions occur in between these states. (5 marks)
- b. **“A process can be terminated voluntarily or involuntarily.”** Explain the ways how a process can be terminated voluntarily or involuntarily. (5 marks)
- c. **“A process can be considered as a grouping of related resources together while a thread is the one who schedules the execution of process in the CPU.”** Discuss this statement distinguishing between Process and thread. (5 marks)

- d. State 3 ways that the threads can be implemented. Explain why implementing threads in user space is not fair. (5 marks)

(Total: 20 marks)

03.

- a. **"Race conditions can be avoided by mutual exclusion of the processes."** Explain the conditions to be satisfied in order to achieve this. State why strict alternation is not a good solution to achieve mutual exclusion. (6 marks)
- b. Explain how a semaphore can be used as a solution for producer-consumer problem of inter process communication. (4 marks)
- c. Distinguish between Priority Scheduling and Round Robin Scheduling. (5 marks)
- d. Explain two general approaches that are dealing with memory overload. (5 marks)

(Total: 20 marks)

04.

- a. Suppose X, Q, R, S, T are some resources and L, M, N, O are the processes holding and waiting for those resources in the following manner.

L holds Q and it waits for T

S is holding by M and it waits for R which is allocated to O

While holding T, O waits for X

N holds X

N is waiting for Q and S

By considering the above explanation, draw the resource graph and identify the processes which are in a deadlock. Explain the reasons for your decisions. (6 marks)

- b. **"Virtualizing the resources is a good example for prevention of Deadlocks by attacking the no preemption condition."** Discuss this statement. (4 marks)

- c. Consider the following scenario:

C, D, E, F are 4 processes waiting for scanner, DVD drive, printer to complete their executions. For each resources, 5, 6, 3 copies of them are available respectively. From these copies, current allocations of them on the processes are as follows.

D is allocated with 2 DVDs and needs 2 printers and 1 scanner immediately.

F is allocated with 3 printers and 2 scanners and needs 2 DVDs and a scanner.

E is allocated with 1 scanner and 1 DVD. Then it needs 3 printers to complete its execution.

C is allocated with 2 scanners and need 2 DVDs.

By using Banker's algorithm, explain whether this situation can lead to a deadlock situation. If not, explain how to allocate resources with safe states. Discuss why bankers' algorithm is not good for avoiding deadlocks. (8 marks)

- d. Explain the structure of an i-node (2 marks)

(Total: 20 marks)

05.

- a. **“With the Direct Memory Access (DMA) presents, CPU can perform with maximum efficiency.”** Discuss this statement. (4 marks)
- b. **“Just as parallel processing within the CPU speeds up its performance, RAID leads for fast accessing of data and enhancing the security of the data in the disks.”** Discuss this statement by analyzing different configurations of RAID. (8 marks)
- c. Explain why the elevator algorithm is better as a disk arm scheduling algorithm for searching the sectors in same cylinder. (3 marks)
- d. State the major disadvantage of FIFO page replacement algorithm. Briefly explain the algorithm which is used to overcome that disadvantage. (5 marks)

(Total: 20 marks)

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