Vavuniya Campus of the University of Jaffna

First Examination in Information and Communication Technology - 2018

Second Semester - April / May 2020

ICT1233 Operating Systems

Answer Five Questions Only

Time Allowed: Three hours

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1. (a) Give any three factors that determine the performance of a computer. [15%]

   (b) Give any three disadvantages of *Batch Systems*. [15%]

   (c) Give any three types of *Operating system* with suitable example for each of the types. [15%]

   (d) Give any three advantages of *Graphical User Interface* in operating systems. [15%]

   (e) Explain briefly the term *kernel*. [10%]

   (f) Differentiate *process* and *thread*. [20%]

   (g) Give any two *Process Control System Call*. [10%]

2. (a) State what is meant by Unauthorized access. [20%]

   (b) List any four key aspect of a good password with suitable examples. [20%]

   (c) Give the Operating System facilities in securing the resources of a computer. [20%]

   (d) State any five attributes of a file stored in a computer. [10%]

   (e) Give the significant difference between "Absolute Path" and "Relative Path" in file storage. [15%]

   (f) Briefly describe about "Disk Caching" in file management. [15%]

3. (a) Write down the responsibilities of a memory manager. [10%]

(b) Describe the following memory replacement algorithms:

i. First fit ii. Best fit iii. Worst fit [15%]

(c) Differentiate the techniques **paging** and **segmentation** in memory management. [10%]

(d) Explain the concept of **Virtual memory**. [10%]

(e) Describe a virtual address generated by the CPU translated into a physical address, with the aid of a suitable diagram. [25%]

(f) The following is a snapshot of memory allocation of a system having processes:A,C,F,G and H with free slot indicated in shades.

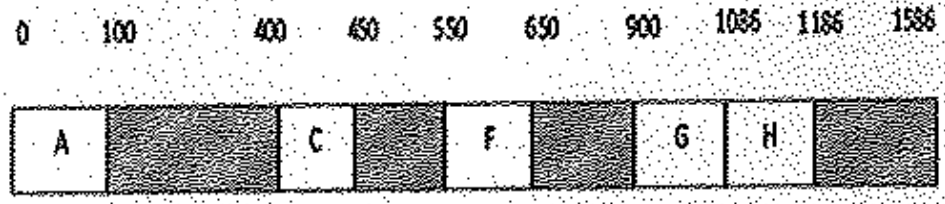

Figure 1: Memory Allocation

Which of the above holes in the system are taken by the process I 200kB, process J 300kB using the following memory replacement polices .

i. First fit,

ii. Best fit, and

iii. Worst fit. [30%]

4. (a) Describe the properties of good process scheduling algorithms. [15%]

(b) Differentiate "preemptive scheduling" and "non-preemptive scheduling". [10%]

(c) There are five processes arrived in a system. The processes arrival time and burst time are given in the following table:

Process	Arrival Time (ms)	Burst Time(ms)
P_1	0	12
P_2	2	4
P_3	5	2
P_4	8	10
P_5	10	6

i. Draw the Gantt chart for the following scheduling for processes:

A. First Come First Serve (FCFS)

B. Shortest Job First (SJF)

C. Round Robin (preemptive and quantum = 4ms). [45%]

ii. Find the following for each of the above scheduling:

A. *turnaround time* for each process. [15%]

B. *average wait* time for each scheduling. [15%]

5. (a) State the necessary and sufficient condition for the occurrence of *deadlock*. [20%]

(b) Distinguish the occurrence of deadlock and starvation. [20%]

(c) A system with five resources (R_1, R_2, R_3, R_4, R_5) and five processes (P_1, P_2, P_3, P_4, P_5) such that R_1 is allocated to P_3, R_2 is allocated to P_1, R_3 is allocated to P_5, R_4 is allocated to P_2 and R_5 is allocated to P_4. P_1 requested R_1, P_2 requested R_3, R_4 and R_5, P_3 requested R_5, and P_4 requested R_2.

i. Draw the wait-for graph, to show that the system is whether in deadlock or not. [15%]

ii. Give step-by-step procedures to recover from deadlock. [15%]

[Question 5 continues on next page.]

(d) A computer system with $R_1 = 20$, $R_2 = 2$, $R_3 = 3$, allocated to five processes is shown in the following table.

Process	max-need			Allocated		
	R_1	R_2	R_3	R_1	R_2	R_3
P_1	100	2	5	70	2	3
P_2	50	3	5	35	1	2
P_3	120	4	7	25	1	3
P_4	150	2	8	20	1	2
P_5	130	3	4	10	-	3

Apply Dijkstra's Bankers algorithm to find a safe sequence. [30%]

6. (a) Describe each of the following terms in process scheduling: [20%]

   i. Critical region.

   ii. Busy waiting.

   (b) Draw the five-state process model and briefly describe each of the states and transitions. [15%]

   (c) Write down four conditions that are necessary for a good solution of mutual exclusion. [20%]

   (d) The lock variable is a solution to prevent mutual exclusion in operating systems. Describe how is it possible to allow two processes to enter their critical region at the same time. [15%]