Vavuniya Campus of the University of Jaffna

First Examination in Information and Communication Technology - 2014

Second Semester - February/March 2016

ICT1233 Operating Systems

Answer **Five** Questions Only

Allowed Time: **Three hours**

---

1. (a) Compare and contrast *Application softwares* and *System softwares*. [20%]

   (b) Briefly describe any four major functions of Operating Systems (OS). [20%]

   (c) Briefly describe what is meant by *Kernel* in OS. [20%]

   (d) Discuss the differences between *Linux* and *Windows* OS. [20%]

   (e) State the difference between *32-bit* and *64-bit* OS. [20%]

2. (a) Differentiate *Program* and *Process*. [20%]

   (b) Briefly describe the reasons for each of the *state transitions* of processes. [20%]

   (c) List down four ways to terminate the processes. [20%]

   (d) Identify the differences between *User Processes* and *System Processes*. [20%]

   (e) Clearly state the use of *Process Control Block* (PCB). [20%]

3. (a) What do you understand by *Race Condition* in Operating Systems. [30%]

   (b) Briefly describe what do you understand by *Critical Section*. [20%]

   (c) Briefly explain how *Mutual Exclusion* and *Critical Section* are used for avoiding race condition. [20%]

   (d) Briefly describe the *Producer Consumer Problem*, and state the solution for it. [30%]

4. (a) Differentiate *CPU bounded* and *I/O bounded* processes. [20%]

   (b) Define each of the following in process scheduling: *"burst time"*, *"waiting time"*, *"turnaround time"*, *and "throughput"*. [20%]

   (c) The table below shows the arrival time and burst time of four processes: A, B, C and D. Process switching overhead is 1 s.

Process	Arrival time (s)	Burst time (s)
A	0	10
B	1	25
C	2	35
D	3	20

   For each of the following scheduling algorithms, draw the grant chart by considering process switching overhead, and determine the mean process turnaround time.

   i. *Round Robin with Quantum = 10 s* [20%]

   ii. *Round Robin with Quantum = 20 s* [20%]

   iii. *First In First Served* [20%]

5. (a) The following Bitmap representation shows the memory allocation for a set of processes:

   1111 0001 1000 0011 1100 1000 0111 1000

   The memory allocation unit size is 1KB.

   i. What is the size of the memory in KB? [05%]

   ii. What is the total size of the free space available in the memory? [05%]

   iii. Represent the memory allocation using *Linked list.* [10%]

   iv. Show the Bitmap representations of the memory allocation after placing a 4KB process using each of the following memory allocation methods:

      A. first fit [10%]

      B. best fit [10%]

      C. worst fit [10%]

   (b) State the use of *Base* and *Limit* registers. [20%]

   (c) Briefly explain the use of *Translation Lookaside Buffer* (TLB) in memory management. [20%]

   (d) Briefly discuss why *Optimal Page Replacement* algorithm is not feasible. [10%]

6. (a) State the ways to prevent *Deadlock.* [20%]

   (b) Consider a system with seven processes A, B, C, D, E, F and G, and five resources R, S, T, U and V. The state of resource allocation and request at a particular time is as follows:

   - Process A holds R and wants S and V.
   - Process B holds S and wants T.
   - Process C holds nothing but wants R.
   - Process D holds U and wants S and R.
   - Process E holds T and wants V.
   - Process F holds nothing but wants S.

- Process G holds V and wants U.

i. Draw a *Resource Allocation Graph* for the above given scenario.

ii. Find whether this system is in deadlock, if so, which processes are involved?

(c) You are given the existence vector E, available resource vector A, current allocation matrix C, and request matrix R, as follows:

$$E = \begin{pmatrix} 5, & 8, & 6, & 7, & 8 \end{pmatrix}$$
$$A = \begin{pmatrix} 2, & 1, & 1, & 3, & 1 \end{pmatrix}$$
$$C = \begin{pmatrix} 2, & 2, & 1, & 2, & 2 \\ 0, & 3, & 2, & 1, & 3 \\ 1, & 2, & 2, & 1, & 2 \end{pmatrix}$$
$$R = \begin{pmatrix} 2, & 1, & 2, & 0, & 2 \\ 1, & 3, & 2, & 1, & 1 \\ 1, & 3, & 2, & 1, & 2 \end{pmatrix}$$

Apply *Bankers algorithm* and find whether the state is safe or unsafe. [4