MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

FIRST YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

MAIN CAMPUS

CIT 110: PLATFORM TECHNOLOGIES I

Date: 21st June, 2017 Time: 12.00 - 3.00 pm

INSTRUCTIONS:

- Answer question ONE and any other TWO questions
- Write your registration number on all sheets of the answer book used.
- Use a NEW PAGE FOR EVERY QUESTION attempted, and indicate number on the space provided on the page of the answer sheet.
- Fasten together all loose answer sheets used.
- Mobile phones and PDAs are NOT allowed in the examination room.

SECTION A: COMPULSORY QUESTION [30 MARKS]

QUESTION 1

a) What are the three main purposes of an operating system? (3 marks)

b) Give two reasons why caches are useful.

i. What problems do they solve? (2 marks)

ii. What problems do they cause? (2 marks)

iii. If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk), why not make it that large and eliminate the device? (2 marks)

c) What is deadlock? And what is starvation? (4 marks)

i. How do they differ from each other? (2 marks)

d) What resources are used when a thread is created? (3 marks)

i. How do they differ from those used when a process is created? (2 marks)

Process	Arrival time	CPU burst time	Priority
A	0	100	3
B	0	10	1
C	0	300	3
D	0	60	5
E	80	150	4

Using information in the above diagram,

a) draw the Gantt chart in case of

i. Non-preemptive (3 marks)

ii. Preemptive (3 marks)

b) compute the average waiting time in case of

i. Non-preemptive (2 marks)

ii. Preemptive (2 marks)

SECTION B: ***ANSWER ANY TWO QUESTIONS*** ***[20 MARKS EACH].***

QUESTION 2

a) File systems can support sparse files, what does this mean? Give an example of an application's file organization that might benefit from a file system's sparse file support. (4 marks)

b) Give an example of a scenario that might benefit from a file system supporting an append-only access write. (4 marks)

c) The file system buffer cache does both buffering and caching.
   i. Describe why buffering is needed. Describe how buffering can improve performance (potentially to the detriment of file system robustness). (3 marks)
   ii. Describe how the caching component of the buffer cache improves performance. (3 marks)

d) List three operating system services that are useful to users. (3 marks)

e) List three operating system functions that maintain efficient operation of the system. (3 marks)

QUESTION 3

a) Describe two file system implementations that use linked lists. (3 marks)
   i. Describe the advantages and disadvantages of each method. (6 marks)

b) Describe the I-node method of implementing a file system. (6 marks)

c) It has been suggested that the first part of each UNIX file be kept in the same disk block as its I-node. What, if any, would be the advantage of doing this? (5 marks)

QUESTION 4

a) Describe the Producer/Consumer problem. (2 marks)

b) Describe the problems associated with producing a software solution to the producer/consumer problem. (4 marks)

c) Show a possible solution to the above problem, stating any assumptions that you make. (4 marks)

d) Diagram this situation (Resources allocation graph): P_1 has acquired the sole instance of R_1 and requested R_2. P_2 has acquired the sole instance of R_2 and requested R_1. (3 marks)

e) Does the situation diagrammed in (d) represent deadlock? (2 marks)

f) Diagram this situation: P_1 has acquired one of two instances of R_2 and requested an instance of R_1. P_2 has acquired one of two instances of R_1 and requested an instance of R_2. P_3 has acquired an instance of R_1. P_4 has acquired an instance of R_2. (3 marks)

g) Does the situation diagrammed in (f) represent deadlock? (2 marks)

QUESTION 5

a) Describe the three state process models, describe what transitions are valid between the three states, and describe an event that might cause such a transition. (8 marks)

b) Consider the following page reference string:

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms, assuming four frames? Remember all frames are initially empty so your first unique pages will all cost one fault each.

i. LRU replacement (4 marks)
ii. FIFO replacement (4 marks)
iii. Optimal replacement (4 marks)

End of Exam