FOUNTAIN UNIVERSITY OSOGBO, NIGERIA
DEPARTMENT OF MATHEMATICAL AND COMPUTER SCIENCES

CPS305 OPERATING SYSTEMS II. C.A.T. **SESSION: 2020/2021**

Instruction(s): **Attempt ALL Questions.** ***Duration:*** **45mins** **20/04/2021**

a) Explain the following terms in relation to Asynchronous Concurrent Programming:
(i) Race Condition (ii) Critical Section (iii) Starvation (iv) Deadlock

b) Describe how mutex locks can be used to solve the critical section problem?

c) Consider, a banking system that maintains an account balance with two functions, deposit() and withdraw(). Assuming a Husband and Wife share same bank account. Concurrently, the husband calls the withdraw() function and the wife call the deposit() function.
(i) Describe how a race condition is possible in the above scenario.
(ii) What might be done to prevent the race condition from occurring?

d) In the context of Dijkstra's Banker's algorithm, given that the number of resources available is two(2), discuss whether the state described in Fig1 below is safe or unsafe. If the state is safe, show how it is possible for all processes to complete. If a state is unsafe, show how it is possible for deadlock to occur.

Process	*max(P1)*	*loan(P1)*	*claim(P1)*
P1	4	1	3
P2	6	4	2
P3	8	5	3
P4	2	0	2

Fig. 1: Resource description for state A

e) Explain the following with suitable diagrams
(i) Swapping (ii) Fragmentation(Internal, External) (iii) Memory Compaction

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CPS305 (OPERATING SYSTEMS II) C.A.T. SESSION: 2022/23 DATE: 01/02/2023

Instructions: *Attempt ALL Questions*

DURATION: 45MINS

a) Explain the following terms in relation to Concurrent Programming:
   i. Race Condition
   ii. Mutual Exclusion
   iii. Starvation
   iv. Deadly embrace

b) Is a spooling system prone to deadlock? Briefly explain.

c) A process repeatedly requests and releases resources of type R1 and R2, one at a time and in that order. There is exactly one resource of each type. A second process also requests and releases these resources one at a time repeatedly. Under what circumstances could these processes deadlock? If so, what could be done to prevent deadlock.

d) Memory organization and management being a major influence in Operating Systems design. Discuss.

e) Enumerate the pros and cons of large and small partition sizes in fixed-partition multiprogramming.

Deadlock
Deadly embrace

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MID - SEMESTER EXAMINATION 2021/2022 SESSION
COURSE TITLE: OPERERATING SYSTEM II COURSE CODE: CPS305 UNIT: 2 UNITS

INSTRUCTION: ANSWER ALL TIME: 30MINS

1. In practice, why is it preferred that the number of frames in memory is a power of two?
2. Write brief answers to the following questions (on memory allocation):
    1. What is the difference between fixed partitioning and dynamic partitioning?
    2. What do fixed partitioning and dynamic partitioning suffer from, respectively?
    3. What does paging allow to do that was not possible with partitioning?
    4. Cite important differences between virtual paging and simple paging.
3. Breifly discuss the following terminologies:
    a. Paging
    b. Segmentation
    c. Fragmentation
    d. Defragentation
    e. Compaction