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1 (Sem-4) COM 4

2025

COMPUTER SCIENCE

Paper : COM0400404

(Operating System)

Full Marks : 45

Time : Two hours

The figures in the margin indicate full marks for the questions.

1. Choose the correct answer : (Each Question carries 1 mark) 1×5=5
- (i) Operating system is an example of
- (A) Application software
 - (B) System software
 - (C) Utility software
 - (D) None of the above

(ii) Which of the following is not a typical scheduling criteria used to assess a CPU scheduling algorithm ?

(A) Turn around time

(B) Waiting time

(C) Response time

(D) Split time

(iii) For a semaphore S , which of the following statements constitutes Signal operation ?

(A) $S--$

(B) $S++$

(C) $S = S * S$

(D) None of the above

(iv) Which of the following is not a necessary condition for deadlock ?

(A) Hold and wait

(B) No preemption

(C) No generalization

(D) Mutual exclusion

(v) In paging, logical address is composed of

(A) Frame number and offset

(B) Page number and offset

(C) Page number and frame number

(D) Base address and frame number

2. Answer **any five** of the following questions :
(Each Question carries **2** marks)

2×5=10

(i) How multiprogramming operating system is better than a uni-programming operating system ?

(ii) What is virtualization ?

(iii) How open source software is different from proprietary software ?

(iv) What is context switching ?

(v) What is long term scheduler ?

- (vi) What is safe state in handling deadlock?
- (vii) How deadlock avoidance scheme is different from deadlock detection scheme?
- (viii) What is memory management unit?
- (ix) What is thrashing?
- (x) Differentiate between Least Recently Used (LRU) and Optimal page replacement algorithms.

3. Answer **any four** of the following questions :
(Each Question carries **5** marks)

5×4=20

- (i) What are different models of cloud computing? Explain briefly each of the models.
- (ii) What are different states of a process? Briefly explain each of the states with a transition diagram.

- (iii) What are different multi threading models used in an operating system ? Explain these models briefly.
- (iv) What is semaphore ? Explain briefly. What are the atomic operations we can perform on a semaphore ? Explain each of the operations.
- (v) Explain the Dining Philosophers' problem. Briefly explain how we can solve this problem using any synchronization tool offered by an operating system.
- (vi) Briefly explain about different components of Resource Allocation Graph. What is the role of Resource Allocation Graph in handling deadlock ?
- (vii) Explain Banker's algorithm.
- (viii) Explain how simple paging scheme works.

4. Answer **any one** of the following questions :
(Each Question carries **10** marks) $10 \times 1 = 10$

(i) Define operating system with examples. What are the major functions of an operating system? Explain.

(ii) What is CPU scheduling algorithm? Define turn around time and waiting time in CPU scheduling. Compute average turn around time, average waiting time and average response time for following five processes using Shortest Job First scheduling algorithm.

Process	Arrival time	Burst time
P0	0	4
P1	0	5
P2	2	3
P3	2	4
P4	5	2

(iii) What are race condition and critical section problem? Explain how Peterson's algorithm works to address critical section problem.

(iv) What are the four necessary conditions for deadlock ? How these conditions are addressed in deadlock prevention scheme ? Explain.
