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Paper Code : MCA-301

OPERATING SYSTEM & SYSTEM SOFTWARE

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) The Operating System acts as a/an

      a) Resource Manager

      b) Interface

      c) both (a) and (b)

      d) none of these.

ii) Which of the following is responsible for selecting a process among the Swapped-out processes and bringing it in the main memory ?

a) Short-term scheduler

b) Medium-term scheduler

c) Long-term scheduler

d) None of these.

iii) A process with multiple threads of control is referred to as a

a) Multithreaded process

b) Single-threaded process

c) Lightweight process

d) Heavyweight process.

iv) Which of the following Operating System modules performs the function of setting up the execution of the selected process on the CPU ?

a) CPU scheduler b) Job scheduler

c) Dispatcher d) None of these.

v) Which of the following is also known as multilevel adaptive scheduling ?

a) Multilevel queue scheduling

b) Multilevel scheduling

c) Multilevel feedback queue scheduling

d) None of these.

vi) Which of the following requirement must be met by a solution to critical-section problem ?

a) Bounded waiting b) Progress

c) Mutual exclusion d) All of these.

vii) Which of the following algorithm suffers from Belady's anomaly ?

a) Optimal page replacement

b) LRU page replacement

c) FIFO page replacement

d) None of these.

viii) In resource allocation graph a directed arc from a resource to a process is known as

a) Request edge b) Claim edge

c) Assignment edge d) none of these.

ix) If there are 32 segments, each of size 1K, then the logical address should have

a) 13 bits b) 14 bits

c) 15 bits d) 16 bits.

x) Which of the following is used for implementing control synchronization ?

a) Semaphore b) Precedence Graph

c) Monitors d) Peterson's algorithm.

xi) Dirty bit is used to show the

a) page with corrupted data

b) the wrong page in memory

c) page that is modified after being loaded into cache memory

d) page that is less frequently assessed.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) What is the difference between Process and Program ?

b) With the help of a state transition diagram, explain various states of a process. 2 + 3

3. Calculate average turnaround time using SJF (Pre-emptive and non pre-emptive) Scheduling algorithm : $2 \times 2\frac{1}{2}$

Process	Arrival Time	CPU Burst
P_0	0	6
P_1	2	4
P_2	3	10
P_3	7	9

4. a) Discuss necessary condition for Deadlock.
   b) What is 'Resource allocation graph' ? 2 + 3
5. Differentiate between External fragmentation and Internal fragmentation.
6. What is Belady's anomaly ? What is thrashing ? 3 + 2

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Differentiate between Paging and Segmentation.
   b) In a demand-paging scheme, how many pages must be loaded from a process to avoid thrashing ?
   c) Consider the following page reference string :
   1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5
   Assume four frames.
   How many page faults would occur for OPT replacement algorithm ? 4 + 6 + 5

8. Calculate the average cylinder movements for the following algorithms : 5 × 3

   i) FCFS ii) SSTF

   iii) SCAN iv) C-SCAN

   v) LOOK

   whereas assume that, Work Queue is 23, 89, 132, 42, 187 and there are 200 cylinders numbered from 0-199 and the disk head stars at number 100.

9. a) Explain if it is possible to have a deadlock involving one single process.

   b) What are the differences between deadlock Preventation and deadlock Avoidance approaches for handling deadlock ?

   c) Consider the following snapshot of a system :

Process	Allocation				Request				Available			
	A	*B*	*C*	*D*	*A*	*B*	*C*	*D*	*A*	*B*	*C*	*D*
P_0	0	0	1	2	0	0	1	2	1	5	2	0
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

   Answer the following questions using Banker's Algorithm :

   i) What is the content of matrix need ?

ii) Is the given system in a safe state ?

iii) If a request from P_1 arrives for (0,4,2,0) can the request be granted immediately ?

2 + 5 + (2 + 3 + 3)

10. a) Explain contiguous allocation and linked list allocation for implementing file storage.

b) Explain critical section problem. State how to solve critical section problem.

c) What are the tasks of loader ?

d) What are the tasks of linker ? 5 + 6 + 2 + 2

11. Write short notes on any *three* of the following : 3 × 5

a) Process control block

b) Translation look-aside buffer (TLB)

c) Context switching

d) Threads

e) Direct memory access (DMA).