Q.4 i. What is deadlock? Explain different conditions of deadlock. **4**

ii. Consider following table: **6**

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

(a) Illustrate that the system is in a safe state by demonstrating an order in which the processes may complete.

(b) If a request from process P_1 arrives for (1,1,0,0) can the request be granted immediately?

(c) If a request from process P_4 arrives for (0,0,2,0) can the request be granted immediately?

OR iii. Explain producer, consumer problem using semaphore. Also write algorithm. **6**

Q.5 i. Define external and internal fragmentation. **4**

ii. Given page reference string: **6**
1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6
Compare the number of page faults for LRU, FIFO and Optimal page replacement algorithm.

OR iii. Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order) in fixed size partitioning? **6**

Q.6 i. Describe at least two file operations. **4**

ii. Discuss in detail any two free space management schemes. **6**

OR iii. Explain following disk scheduling algorithms: **6**
(a) SSTF (b) SCAN (c) C-SCAN

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Faculty of Science

End Sem (Even) Examination May-2019

CA3CO12 Operating System

UNIVERSITY
Knowledge is Power

Programme: BCA   Branch/Specialisation: Computer Application

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Which of the following requires a device driver? **1**
(a) Register (b) Cache
(c) Main memory (d) Disk

ii. The process of transferring data intended for a peripheral device into a disk (or intermediate store) so that it can be transferred to peripheral at a more convenient time or in bulk, is known as **1**
(a) Multiprogramming (b) Spooling
(c) Caching (d) Virtual programming.

iii. Consider the following table of arrival time and burst time for three processes P0, P1 and P2. **1**

Process	Arrival time	Burst Time
P0	0 ms	9 ms
P1	1 ms	4 ms
P2	2 ms	9 ms

The pre-emptive shortest job first scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes. What is the average waiting time for the three processes?
(a) 5.0 ms (b) 4.33 ms (c) 6.33 ms (d) 7.33 ms

iv. Which of the following statements are true? **1**
I. Shortest remaining time first scheduling may cause starvation
II. Pre-emptive scheduling may cause starvation
III. Round robin is better than FCFS in terms of response time
(a) I only (b) I and III only
(c) II and III only (d) I, II and III

v. A single processor system has three resource types X, Y and Z, which are shared by three processes. There are 5 units of each resource type. Consider the following scenario, where the column alloc denotes the number of units of each resource type allocated to each process, and the column request denotes the number of units of each resource type requested by a process in order to complete execution. Which of these processes will finish LAST? **1**

```
         alloc        request
         X Y Z        X Y Z
   P0    1 2 1        1 0 3
   P1    2 0 1        0 1 2
   P2    2 2 1        1 2 0
```

(a) P0
(b) P1
(c) P2
(d) None of these, system is in deadlock

vi. Deadlock prevention is a set of methods: **1**
(a) To ensure that at least one of the necessary conditions cannot hold
(b) To ensure that all of the necessary conditions do not hold
(c) Both (a) and (b)
(d) None of these

vii. Suppose the time to service a page fault is on the average 10 milliseconds, while a memory access takes 1 microsecond. **1**
Then a 99.99% hit ratio results in average memory access time of
(a) 1.9999 milliseconds   (b) 1 millisecond
(c) 9.999 microseconds   (d) 1.9999 microseconds

viii. Paging increases the _____ time. **1**
(a) Waiting   (b) Execution
(c) Context – switch   (d) All of these

ix. A file control block contains the information about **1**
(a) File ownership   (b) File permissions
(c) Location of file contents (d) All of these

x. File type can be represented by **1**
(a) File name   (b) File extension
(c) File identifier   (d) None of these

Q.2 i. What is operating system? Mention any three services of operating system. **4**

ii. There are several design goal in building an operating system, for example, resource utilization, timeliness, robustness, and so on. Give an example of two design that may contradict one other? **6**

OR iii. Differentiate between Distributed OS and Network OS. Also write their advantages and disadvantages. **6**

Q.3 i. Consider a multiprogramming system with degree of 5 (that is 5 program memory at same time). Assume that each process spends 40% of its time waiting for I/O. What will be the CPU utilization? **4**

ii. Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here: **6**

Process	Arrival Time	Burst Time
P_0	0	80
P_1	10	20
P_2	10	10
P_3	80	20
P_4	85	50

(a) Suppose a system uses RR scheduling with a quantum of 15. Create a Gantt chart illustrating the execution of these processes?
(b) What is the turnaround time for process p3?
(c) What is the average wait time for the processes?

OR iii. Five batch jobs A through E, arrive at a computer centre at almost same time. They have estimated running times of 10,6,2,4 and 8 minutes. Their (externally determined) priorities are 3,5,2,1 and 4 respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process switching overhead. **6**
(a) Priority Scheduling   (b) FCFS (run in order 10,6,2,4,8)
(c) SJF
Assume that only one job at a time runs, until it finishes. All jobs are completely CPU bound.

P.T.O.

Q.1 i. Which of the following requires a device driver? **1**
(d) Disk

ii. The process of transferring data intended for a peripheral device into a **1** disk (or intermediate store) so that it can be transferred to peripheral at a more convenient time or in bulk, is known as
(b) Spooling

iii. Consider the following table of arrival time and burst time for three **1** processes P0, P1 and P2.

Process	Arrival time	Burst Time
P0	0 ms	9 ms
P1	1 ms	4 ms
P2	2 ms	9 ms

The pre-emptive shortest job first scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes. What is the average waiting time for the three processes?
(a) 5.0 ms

iv. Which of the following statements are true? **1**
(d) I, II and III

v. Which of these processes will finish LAST? **1**
(c) P2

vi. Deadlock prevention is a set of methods: **1**
(a) To ensure that at least one of the necessary conditions cannot hold

vii. Suppose the time to service a page fault is on the average 10 milliseconds, **1** while a memory access takes 1 microsecond.
Then a 99.99% hit ratio results in average memory access time of
(d) 1.9999 microseconds

viii. Paging increases the _____ time. **1**
(c) Context – switch

ix. A file control block contains the information about **1**
(d) All of these

x. File type can be represented by **1**
(b) File extension

Q.2 i. Definition of operating 1 Mark **4**
Services of operating system 3 Marks

ii. Resource utilization, timeliness, robustness, and so on. Example of two **6** design that may contradict one other? (3 Marks *2)

OR iii. Difference between Distributed OS and Network OS. 3 Marks **6**
OS their advantages and disadvantages 3 Marks

Q.3 i. What will be the CPU utilization? **4**
ii. (a) Creation of a Gantt chart 2 Marks **6**
(b) Turnaround time for process p3 2 Marks
(c) Average wait time for the processes 2 Marks

OR iii. (a) Priority Scheduling 2 Marks **6**
(b) FCFS (run in order 10,6,2,4,8) 2 Marks
(c) SJF 2 Marks

Q.4 i. Define deadlock 1 Mark **4**
Different conditions of deadlock. 3 Marks

ii. (a) Illustrate that the system is in a safe state by demonstrating an order **6** in which the processes may complete. 2 Marks
(b) If a request from process P_1 arrives for (1,1,0,0) can the request be granted immediately? 2 Marks
(c) If a request from process P_4 arrives for (0,0,2,0) can the request be granted immediately? 2 Marks

OR iii. Producer, 2 Marks **6**
consumer problem using semaphore 2 Marks
Algorithm. 2 Marks

Q.5 i. Define external 2 Marks **4**
Define internal fragmentation. 2 Marks

ii. Compare the number of page faults **6**
For LRU 2 Marks
FIFO 2 Marks
Optimal page replacement algorithm. 2 Marks

OR iii. First-fit, algorithms 2 Marks **6**
Best-fit, algorithms 2 Marks
Worst-fit algorithms 2 Marks

Q.6 i. Describe at least two file operations (2 marks *2) **4**
ii. Two free space management schemes. (3 Marks* 2) **6**

OR iii. Disk scheduling algorithms: **6**
(a) SSTF 2 Marks
(b) SCAN 2 Marks
(c) C-SCAN 2 Marks

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