Printed page: 03 **Subject Code: AMCA0102**

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MASTER OF COMPUTER APPLICATIONS (MCA)

SEM: First, Theory Examination (2020-2021)

SUBJECT : OPERATING SYSTEM

Time: 3 Hours **Max. Marks: 100**

General Instructions:

- All questions are compulsory. Answers should be brief and to the point.
- This Question paper consists of 03 pages & 8 questions.
- It comprises of three Sections, A, B, and C. You are to attempt all the sections.
- Section A -Question No- 1 is objective type questions carrying 1 mark each, Question No- 2 is very short answer type carrying 2 mark each. You are expected to answer them as directed.
- Section B - Question No-3 is Long answer type -I questions with external choice carrying 6 marks each. You need to attempt any five out of seven questions given.
- Section C - Question No. 4-8 are Long answer type –II (within unit choice) questions carrying 10 marks each. You need to attempt any one part *a* or *b*.
- Students are instructed to cross the blank sheets before handing over the answer sheet to the invigilator.
- No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION – A

1. Answer all of the following: **[10×1=10]** **CO**

a. Operating system is a _____. **(1)** **CO1**
- **(i)** Utility software
- **(ii)** System software
- **(iii)** Application software
- **(iv)** None of these

b. Which of the following services provides of an operating system? **(1)** **CO1**
- **(i)** API
- **(ii)** Assembly instruction
- **(iii)** Library
- **(iv)** System call

c. Where process synchronization can be done? **(1)** **CO2**
- **(i)** Software level
- **(ii)** Hardware level
- **(iii)** Both software level and hardware level
- **(iv)** None of these

d. Mutual exclusion can be achieved by _____ . **(1)** **CO2**
- **(i)** Binary semaphore
- **(ii)** Mutex lock
- **(iii)** Both binary semaphore and mutex lock
- **(iv)** None of these

e. A process can be _____ . **(1)** **CO3**
- **(i)** Single threaded
- **(ii)** Multithreaded
- **(iii)** Both single threaded and multithreaded
- **(iv)** None of these

f. Basic unit of CPU utilization is _____ . **(1)** **CO3**
- **(i)** Process
- **(ii)** Program
- **(iii)** Thread
- **(iv)** None of these

g.	How address is specified in segmentation? **(i)** By segment number **(ii)** By offset **(iii)** By a value **(iv)** By both segment number and offset	**(1)**	**CO4**
h.	CPU generates: **(i)** Physical address **(ii)** Logical address **(iii)** Absolute address **(iv)** Both physical address and logical address	**(1)**	**CO4**
i.	When a process issues an I/O request: **(i)** It is placed in the waiting queue **(ii)** It is placed in the I/O queue **(iii)** It is placed in the job queue **(iv)** It is placed in the ready queue	**(1)**	**CO5**
j.	Which of the following system call creates a new process in Unix? **(i)** Fork **(ii)** Create **(iii)** New **(iv)** None of these	**(1)**	**CO5**

2.	**Answer <u>all</u> of the following:**	**[5×2=10]**	**CO**
a.	Compare microkernel and monolithic kernel.	**(2)**	**CO1**
b.	Briefly discuss inter process communication models.	**(2)**	**CO2**
c.	How to recover from a deadlock?	**(2)**	**CO3**
d.	Discuss the concept of locality of reference.	**(2)**	**CO4**
e.	Why buffering is required?	**(2)**	**CO5**

SECTION – B

3.	**Answer any <u>five</u> of the following:**	**[5×6=30]**	**CO**
a.	Differentiate among multiprogramming, multiprocessing and multitasking systems.	**(6)**	**CO**
b.	When binary and counting semaphores are used?	**(6)**	**CO2**
c.	Define deadlock. What are the necessary conditions that an operating system must satisfy for a deadlock to happen?	**(6)**	**CO3**
d.	Explain the use of page table.	**(6)**	**CO4**
e.	What is security? Elaborate goals of security.	**(6)**	**CO5**
f.	How cache memory helps for fast processing?	**(6)**	**CO4**
g.	Discuss and draw process state transition diagram.	**(6)**	**CO3**

SECTION – C

4	**Answer any <u>one</u> of the following:**	**[5×10=50]**	**CO**
a.	What are the issues in operating system design? Discuss about layered structure of operating system.	**(10)**	**CO1**
b.	Explain different types of operating systems with their advantages and disadvantages.	**(10)**	**CO1**
5.	**Answer any <u>one</u> of the following:**		
a.	What is critical section problem? Elaborate how Dekker's solution solves the critical section problem.	**(10)**	**CO2**
b.	Discuss Dining Philosopher problem. How semaphore solves Dining Philosopher	**(10)**	**CO2**

problem?

6. Answer any one of the following:

a. Let us consider the following processes with their arrival time and CPU burst time given in millisecond: - **(10)** **CO3**

Process No.	Arrival Time	CPU Burst Time
P1	3	4
P2	5	3
P3	0	2
P4	5	1
P5	4	3

Answer the following questions by using FCFS scheduling algorithm:

i) Draw the Gantt chart
ii) Calculate average turnaround time
iii) Calculate average waiting time
iv) Calculate average response time

b. The following is a snapshot of a system: **(10)** **CO3**

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P1	0 0 1 2	0 0 1 2	1 5 2 0
P2	1 0 0 0	1 7 5 0	
P3	1 3 5 4	2 3 5 6	
P4	0 6 3 2	0 6 5 2	
P5	0 0 1 4	0 6 5 6	

Answer the following questions by using Banker's algorithm:

i) How many resources of type A, B, C and D are there?
ii) What are the contents of need matrix?
iii) Find if the system is in safe state. If it is, find the safe sequence.

7. Answer any one of the following:

a. Consider the page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 3 with 4 page frames. Find the number of page faults by using optimal page replacement and least recently used page replacement algorithms. **(10)** **CO4**

b. Define fragmentation. Distinguish between different types of fragmentation. How virtual memory improves the performance of a computer system? **(10)** **CO4**

8. Answer any one of the following:

a. Why RAID is adopted? Discuss different RAID levels. **(10)** **CO5**

b. Let us Consider a disk queue with random requests for cylinder number 80, 185, 15, 195, 65, 155, 85, 170, 90. There are 200 cylinders numbered from 0-199. The disk head starts at cylinder number 80. Find out the total disk head movement by using FCFS, SSTF and SEEK algorithms. **(10)** **CO5**