Course Code : CAT 203 **KQLR/RS – 24 / 1518**

Third Semester B. Tech. (Computer Science and Engineering) / (Artificial Intelligence and Machine Learning) Examination

OPERATING SYSTEM

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Assume suitable data wherever necessary.
(2) All questions carry marks as indicated.

1. (a) How does the distinction between two modes function as a basic form of system security ? 3(CO1)

   (b) Differentiate between Multiprogramming and Time Sharing system. 3(CO1)

   (c) Discriminate system command and system call. Also explain how system call gets processed by the system. 4(CO1)

2. (a) Consider the following set of processes, with the length of the CPU burst given in milliseconds :

Process	Burst Time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5 all at time 0.

(i) Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms : FCFS, SRTF, preemptive priority (a larger priority number implies a higher priority) and RR (quantum 2).

(ii) Calculate average turnaround time and waiting time.

(iii) Which of the algorithms results in the minimum average waiting time (over all processes) ? 6(CO3)

(b) What is the significance of Process Control Block (PCB) in operating system? Discuss the important information kept in PCB of a process. 4(CO2)

3. (a) Discuss semaphore-based solution to the producer-consumer problem using a bounded buffer. 5(CO4)

(b) How TestAndSet ( ) and Swap ( ) instructions can be used to solve the mutual exclusion problem ? 5(CO4)

4. (a) Consider the following snapshot of a system with three processes and answer the questions using Banker's algorithm :

Allocation				Max			Available		
	X	Y	Z	X	Y	Z	3	2	2
P0	0	0	1	8	4	3			
P1	3	2	0	6	2	0			
P2	2	1	1	3	3	3			

(i) Find total number of instances available for each resource type at startup.

(ii) What is the content of the matrix Need ?

(iii) Is the system in a safe state ? If 'Y', state the safe sequence.

(iv) If P1 requests (2, 1, 1), can the request be granted Immediately ? 5(CO3)

(b) What are the necessary and sufficient conditions for deadlock to occur ? How one can restrict circular hold and wait condition to prevent deadlock ? 5(CO3)

5. (a) Assuming a 1-KB page size, what are the page numbers and offsets for the following address references :

(1) 2375

(2) 19366

(3) 256

(4) 16385 2(CO3)

(b) Consider the following page reference string :

1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2. How many page faults would occur for the following replacement algorithm, Assuming four frames respectively ?

(i) LRU page replacement.

(ii) FIFO page replacement.

(iii) Optimal page replacement. 5(CO3)

(c) Consider a paging system with the page table stored in memory :

(a) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take ?

(b) If we add TLBs and 75 percent of all page-table references are found in the TLBs, what is the effective memory reference time ? (Assume that finding a page-table entry in the TLB takes zero time, if the entry is there.) 3(CO2)

6. (a) Suppose that the head of moving head disk with 200 tracks numbered 0 to 199 is currently serving the request at track 143 and has just finished a request at track 125. If the queue request is kept in FIFO order,

86, 147, 91, 177, 94, 150, 102, 175, 130

What is the total head movement to satisfy these requests for FCFS, SCAN, LOOK disk scheduling algorithm ? Which algorithm will be more efficient and why ? 6(CO3)

(b) How Tree Structured Directories differ from Acyclic Graph directories ? Explain. 2(CO2)

(c) What is external fragmentation ? What are the drawbacks of allocation methods in terms of external fragmentation ? 2(CO2)