Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institution of Manipal University

V SEMESTER B.TECH. (INFORMATION TECHNOLOGY)

MAKEUP EXAMINATIONS, JANUARY 2017

SUBJECT: OPERATING SYSTEMS [ICT 3101]

REVISED CREDIT SYSTEM
(05/01/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data, if any, may be suitable assumed.

1A. Consider an operating system running a round-robin scheduler with a 50 msec time quantum. There are three processes with the following characteristics:
Process A runs for 60 msec, blocks for 100 msec, runs for 10 msec and terminates.
Process B runs for 70 msec, blocks for 40 msec, runs for 20 msec, and terminates.
Process C runs for 20 msec, blocks for 80 msec, runs for 60 msec, and terminates.
Process A enters the system at time 0, process B enters at time 10 msec, process C enters at time 20 msec. Trace the evolution of the system by using the Gantt chart. Ignore the time required for a context switch. Calculate the average waiting time, average turnaround time and average response time. How will the system be affected in terms of average waiting time and average turnaround time if it uses preemptive Shortest Job First? **5**

1B. Explain the three variations of send() and receive() primitives used to establish a communication link in a message passing system. **3**

1C. With a neat diagram explain the components of the Linux system. **2**

2A. Give the definition of Swap() and TestAndSet() instructions, and write implementation code that provides mutual-exclusion by using these two hardware instructions. Describe how TestAndSet() can be used to provide mutual exclusion that satisfies bounded-waiting requirement. **5**

2B. Explain the final version of the Dekker's algorithm. Justify how it meets the three requirements of critical section problem. **3**

2C. Explain the role of operating system from the viewpoint of user and system. **2**

3A. The memory access time is 1 nanosecond for a read operation with a hit in TLB, 5 nanoseconds for a read operation with a miss in TLB, 2 nanoseconds for a write operation with a hit in TLB and 10 nanoseconds for a write operation with a miss in TLB. Execution of a sequence of instructions involves 100 instruction fetch operations, 60 memory operand read operations and 40 memory operand write operations. The TLB hit-ratio is 90%. Determine the average memory access time (in nanoseconds) in executing the sequence of all instructions by providing detailed steps. **5**

3B. Differentiate between the multilevel queue scheduling and the multilevel feedback queue scheduling. **3**

3C. Describe the method used to set a bound on the number of threads concurrently active in the system. Mention the benefits of using this method. **2**

4A. Write the pseudocode for Safety algorithm used in Banker's deadlock avoidance method. What are the disadvantages of banker's algorithm? Consider the following snapshot of the system.

Process	Allocation	Maximum	Available
	A B C D	A B C D	A B C D
P0	0 0 1 3	0 0 1 3	2 1 0 0
P1	2 0 0 0	2 7 5 0	
P2	0 1 3 5	6 6 5 7	
P3	2 3 5 5	4 3 5 6	
P4	0 3 3 3	0 6 5 4	

i. Calculate the need matrix and the total resource vector.
ii. Is the system in safe state? If yes what is the safe sequence?.
iii. If a request from process P2 arrives for (0, 1, 0, 0) can the request be granted immediately?
iv. If a request from process P3 arrives for (2, 0, 0, 0) can the request be granted immediately? **5**

4B. Suppose the following disk request sequence (track numbers) for a disk with 100 tracks is given: 45, 20, 90, 10, 50, 60, 80, 25, 70. Assume that the initial position of the Read/Write head is on track 50. Find the additional distance in terms of tracks, that will be traversed by the Read/Write head when the Shortest Seek Time First (SSTF) algorithm is used compared to the SCAN (Elevator) algorithm assuming SCAN algorithm moves towards 100 when it starts execution. **3**

4C. A file system with 300 GB uses a file descriptor with 8 direct block address, 1 indirect block address and 1 doubly indirect block address. The size of each disk block is 128 Bytes and the size of each disk block address is 8 Bytes. Find the maximum possible file size in this file system. Justify the answer. **2**

5A. Write a note on the following with respect to virtual memory:
i. Thrashing
ii. Local page replacement
iii. Global page replacement
iv. Equal partition frame allocation
v. proportional frame allocation. **5**

5B. Let a memory have four free blocks of sizes 4k, 8k, 20k, 2k. The allocation requests are stored in a queue as shown below.

Request No	J1	J2	J3	J4	J5	J6	J7	J8
Request Sizes	2k	14k	3k	6k	6k	10k	7k	20k
Usage Time	4	10	2	8	4	1	8	6

Show the allocation of jobs by using the first-fit method. If these blocks are allocated following the best-fit strategy, at what time the request for J7 will be completed? Explain. **3**

5C. What type of fragmentation occurs in simple paging systems? Explain. **2**