MASTER OF TELE-COMMUNICATION ENGINEERING EXAMINATION, 2018
(1st Semester)

OPERATING SYSTEMS

Time : Three Hours   Full Marks : 100

Answer *any five* questions.

1. a) What are the necessary conditions for deadlock? Write safety algorithm in connection with deadlock and explain conceptually.   5 + 5

   b) Consider the system described by the following table. Is the system safe?   10

	Allocation	Max	Available
	A B C	A B C	A B C
P0	0 1 0	7 5 3	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	
P4	0 0 2	4 3 3	

2. a) Define various performance criteria used for comparing CPU scheduling algorithms.   10

   b) Assume you have the following processes to execute with one processor. All five processes arrive at time 0, in the order given, with the length of the CPU – burst time given in milliseconds.

Process	Burst Time
P_1	10
P_2	29
P_3	3
P_4	7
P_5	12

   Consider the FCFS, SJF, and RR (quantum = 10 milliseconds) scheduling algorithms for this set of processes. Which algorithm would give the minimum average waiting time?   10

1

3. a) Describe the MVT scheme of memory management with reference to the hardware required to support the scheme. 10

b) Consider a paging system with the page table stored in memory.
(i) If a memory reference takes 200 ns, how long does a paged memory reference take?
(ii) If we add associative registers, and 75% of all page table references are found in the associative registers, what is the effective memory reference time? Assume that finding a page table entry in the associative registers takes zero time, if the entry is there. 5

c) Describe the paged segmentation scheme of memory management. 5

4. a) Draw the precedence graph with the following precedence relations:
S1→S2, S1→S3, S1→S4, S2→S5, S3→S5, S4→S6, S5→S6.
Transform the graph to a program using
(i) the parbegin/parend statement.
(i) the fork and join constructs. 10

b) Suppose the precedence graph in (a) is modified by adding the edge (S2, S4) to the graph. Can this new precedence graph be expressed using only parbegin/parend statement? If so, show how; if not, explain why? How can this precedence graph be expressed if semaphores can also be used? 10

5. a) State the reader/writers problem. Give a solution to the problem using semaphores and explain. 10

b) Discuss the Peterson's Algorithm as a solution to the critical section problem for 2 processes and show that it satisfies all the requirements of part (a). 10

6. a) When do page faults occur? Describe the actions taken by the operating system when a page fault occurs. What is its effect of page fault on the performance of a system? 2+4+4

b) Given references to the following pages by a program:
2, 3, 4, 3, 2,   4, 3, 2, 4, 5,   6, 7, 5, 6, 7,   4, 5, 6, 7, 2,1
How many page faults will occur if the program has three frames available to it and uses:
   i)   First-In-First-Out (FIFO) replacement strategy
   ii)   Least-Recently-Used (LRU) replacement strategy
   iii) Optimal Replacement strategy.

10

7. Write notes on the following: 5x4
   a) Process state diagram.
   b) Kernel of an Operating System.
   c) Multilevel feedback queue scheduling.
   d) Resource allocation graph