Ex/PG/ ETCE/T/111B/16/2017

MASTER OF TELE-COMMUNICATION ENGINEERING EXAMINATION, 2017
(1st Semester)

OPERATING SYSTEMS

Time : Three Hours | Full Marks : 100

Answer ***any five*** questions.

1. a) Write bankers' algorithm in connection with deadlock and explain conceptually with the help of state transitions. 5 + 5

b) Consider the following resource allocation state involving five processes and five resources. Total (j) specifies the total number of instances of resource j (including both allocated and free instances). Alloc [i, j] denotes the number of instances of resource j currently allocated to process i. Req [i, j] denotes the number of instances of resource j that process i is currently requesting. Determine which process (if any) are deadlocked.

Total = [11, 10, 6, 9, 6]
Alloc = [[1, 0, 2, 4, 1], [0, 1, 0, 2, 3], [0, 0, 1, 0, 0], [0, 1, 0, 1, 0], [1, 0, 0, 1, 2]]
Req = [[1, 5, 4, 2, 2], [1, 0, 0, 7, 2], [8, 8, 2, 0, 0], [6, 6, 6, 6, 6], [7, 3, 0, 1, 0]]
10

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

3. a) Describe the paging 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) Consider the following segment table:

Segment	Base	Length
0	330	124
1	876	211
2	111	99
3	498	302

What are the physical addresses for the following logical addresses? If the address generates a segment fault, indicate so.

i) (0, 99)
ii) (2, 78)
iii) (1, 265)
iv) (3, 222)
v) (0, 111)

5

4. a) Draw the precedence graph with the following precedence relations:

S1→S2, S1→S3, S2→S4, S4→S5, S4→S6, S5→S7, S6→S7, S3→S7.
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 deleting the edge (S3, S7) and adding the edge (S3, S6). 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) Define a critical section and the critical section problem, and explain the requirements of a solution to the critical section problem. 10

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

6. a) What is thrashing? What is its effect on the performance of a system? Discuss various methods to control it. 1+2+7

b) Given references to the following pages by a program:

0, 9, 0, 1, 8, 1, 8, 7, 8, 7, 1, 2, 8, 2, 7, 8, 2, 3, 8, 3

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 Control Block (PCB).
b) Belady's Anomaly.
c) Bernstein's conditions for concurrency.
d) Resource allocation graph