B.ETCE 4TH YEAR 1ST SEMESTER EXAMINATION 2019

OPERATING SYSTEMS

Time: Three hours | Full Marks: 100

Answer any ten from Q no. 1 | 10x2=20

a) What are the different types of kernel in OS?
b) What is the purpose of the command interpreter?
c) Give the full form of XDR.
d) What do you understand by Real time system?
e) Name components of a program state that are shared across threads in a multithreaded process?
f) What is starvation?
g) What is deadlock?
h) Name the different types of semaphore?
i) What is the function of the dispatcher?
j) What is a multilevel queue?
k) When do page faults occur?
l) What is thrashing?
m) Why are page sizes always a power of 2?
n) Why is paging faster than segmentation?

2. | 10x3

a) What is meant by context switching in operating systems? Describe the actions taken by a kernel to context-switch between processes.
b) What is the producer consumer process in OS?
c) Support for threads is provided at two levels. Name them and hence classify the three models in which the two levels are connected. What is a thread library?
d) What is the problem of starvation in CPU scheduling algorithms? Explain which scheduling algorithms have a possibility of producing starvation?
e) Explain why interrupt and dispatch latency times must be bounded in a hard real-time system.

3. | 10x3

a) Assume that a context switch takes T time. Suggest an upper bound in terms of T for holding a spinlock. If the spinlock is held for any longer, a mutex lock is a better alternative.
b) Consider a system consisting of processes P_1, P_2,...,P_3, each of which has a unique priority number. Write a monitor that allocates three identical printers to these processes, using the priority numbers for deciding the order of allocation.
c) Givensix memory partitions of 300KB, 600 KB, 350 KB, 200 KB, 750 KB and 125 KB (in order), how would the first-fit, best-fit and worst-fit algorithms place processes of size 115 KB, 500 KB,

358 KB, 200 KB, and 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory.

d) Consider the following set of processes, with the length of the CPU burst given in ms:

	Process	Burst Time	Priority
i.			
ii.	P_1	10	3
iii.	P_2	1	1
iv.	P_3	2	3
v.	P_4	1	4
vi.	P_5	5	2

   b. The processes are assumed to have arrived in the order shown all at time 0.
   c. Create a Gantt chart showing the execution of these processes using the following scheduling algorithms: FCFS, SJF, RR with quantum 1.
   d. What is the turnaround time of each process for FCFS?
   e. What is the waiting time of the processes for SJF?
   f. Which of the algorithms results in the minimum average waiting time?

e) Consider a logical address space of 256 pages with a 4-KB page size, mapped onto a physical memory of 64 frames. (i) Find the no. of bits required in the logical address. (ii) Find the no. of bits required in the physical address.

4. 10x2

a) Consider a system consisting of m resources of the same type being shared by 3 processes, each of which needs at most two resources. Show that the system is deadlock free.

b) Demonstrate that monitors and semaphores are equivalent in so far as they can be used to implement solutions to the same types of synchronization problems.

c) Consider the following page reference string: 7,2,3,1,2,5,3,4,6,7,7,1,0,5,4,6,2,3,0,1. Assume demand paging with three frames, how many page faults would occur for the following replacement algorithms? I) LRU replacement, ii) FIFO replacement and iii) optimal replacement