

B. ETCE 4TH YEAR 1ST SEM. EXAM.-2018**OPERATING SYSTEMS**

Time: Three hours

Full Marks: 100

Answer Q no. 1 and any four from the rest

Answer any ten from Q no. 1.

2x10

- 1.a) What is the purpose of the command interpreter?
- b) Why is the CI usually separate from the kernel?
- c) What are the main functions of a Kernel?
- d) What are the different types of Kernel?
- e) What are the disadvantages of Micro-Kernels?
- f) What are the two models of interprocess communications?
- g) How is a process different from a program?
- h) What is a PCB? Give another name for it?
- i) Define a job queue and a ready queue?
- j) What is a semaphore? Name the two types of semaphore?
- k) What is a monitor?
- h) How is a cache memory different from main memory?

- 2.a) State the characteristics of a good process scheduler

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

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are assumed to have arrived in the order shown all at time 0.

- i) Create a Gantt chart showing the execution of these processes using the following scheduling algorithms: FCFS, SJF, RR with quantum 1.
- ii) What is the turnaround time of each process for FCFS?
- iii) What is the waiting time of the processes for SJF?
- iv) Which of the algorithms results in the minimum average waiting time?

6+3+3+3

- 3.a) With an example briefly explain Critical Section problem. Mention two approaches to overcome this? Which method is better and why?

5+2+5

[Turn over

- b) Show how to implement the `wait()` and `signal()` semaphore operations in multiprocessor environments using the Test And Set () instruction. The solution should exhibit minimal busy waiting. 8
- 4.a) What is the dining philosophers problem in operating systems? Explain it with a proper algorithm. Design a starvation free solution. 3+4+5
- b) Given memory partitions of 100k, 500k, 200k,300k and 600k (in order), how would each of the First-fit, Best-fit and Worst-fit algorithms place processes of 212k, 417k, 112k and 426k (in order)? Which algorithm makes the most efficient use of memory? 8
5. a) Why are interrupts not appropriate for implementing synchronization primitives in multiprocessor systems? Explain. 6
- b) 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. 6
- c) Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Show that the system is deadlock free. 8
- 6.a) What is swapping in memory management? When is a process required to be swapped out of memory? Why does iOS and Android not support swapping? 5+5+5
- b) Let there be a user process of 100MB and a backing store with a transfer rate of 50 MB per second. Find the total swap time for a latency of say 5 ms. 5
- 7.a) Compare the memory organization scheme of contiguous memory allocation, pure segmentation and pure paging with respect to the following issues:
- (i) External fragmentation
 - (ii) Internal fragmentation 10
- b) Consider a logical address space of 256 pages with a 4 KB page size, mapped onto a physical memory of 64 frames.
- (i) How many bits are required in the logical address?
 - (ii) How many bits are required in the physical address? 10