

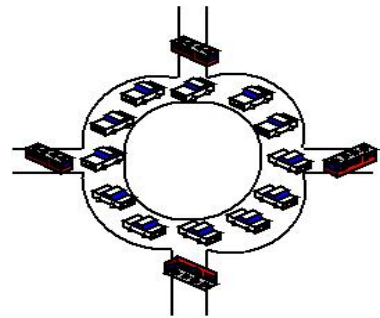
國立臺灣師範大學資訊工程學系
九十九學年度第一學期
博士班資格考

考試科目：作業系統

總分一百分

請在答案卷作答，在題目卷上作答不予計分

1. (10 pts) iPhone used to have only single tasking OS until iOS 4 while Android always has multitasking. What's the advantages and disadvantages of single tasking vs. multitasking on smart phones? Give an example on how users can use multitasking function on smart phones.
2. (10 pts) iOS has something call “fast application switching”, which, when the main memory is full, *suspends* an application when the user switches to another application, e.g., a car racing game application is *suspended* when the user switches to a web browsing application. What do we call this operation in operation systems? Describe and illustrate what really happens from the operating system's point of view for the above example.
3. (15 pts) In the figure to the right, all the cars in the traffic circle are taking one of the exit and all the buses are trying to enter the circle but there is no more room for any of them. To avoid being hit, if the car driver sees the exit he wants to take, but is blocked by the bus, he will keep on driving rather than stop and wait. So all the cars in the circle are always moving. Is this considered as a deadlock situation? Why or why not? Which conditions of deadlocks are satisfied or not satisfied?
4. (10 pts) We use a lot of dual-core, quad-core CPUs nowadays. What are the two general approaches to load balance between these CPU cores? Load balancing counteracts the benefits of processor affinity, why and how?
5. (5 pts) We can divide a computer system into four components: the hardware, the operation systems, the application programs, and the users. Which functions do operating systems usually handle? Describe or illustrate.



6. (10 pts) Please explain the following terms in short sentences
- (a) DMA (Direct Memory Access)
 - (b) mount/umount (Unix commands)
 - (c) polling
 - (d) device driver
 - (e) memory-mapped I/O
7. (10pts) Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order is
- 98, 183, 67, 65, 122, 37, 14, 124
- Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?
- (a) FCFS
 - (b) SSTF
 - (c) C-SCAN
 - (d) LOOK
8. (20pts) Consider the following hardware configurations.
- page size 8K Bytes
 - logical address space 32G Bytes
 - RAM installed 512M
- (a) (5pts) How many bits are in a logical address?
 - (b) (5pts) Given this virtual memory system operates in 2-level paging in the figure below. If P1 and P2 have same number of bits, how many bytes should a page table entry occupies?
- | | | |
|----|----|--------|
| P1 | P2 | Offset |
|----|----|--------|
- (c) (5pts) Let the virtual memory system operate in 2-level paging, If a program's size is 5M, how many page tables should be allocated for the program?
 - (d) (5pts) If an inverted page table virtual memory system is implemented, how many page table entries are needed in the inverted page table?
9. (10pts) You have been hired to design a custom file system to store multimedia data. This special file system needs to support the storage of large sequential accessed video files. Normal files will be stored on another file system. Only one video file will be accessed at a time. Also, once they are created, video files will never be deleted or modified, and the size of each video is known at creation time. Sketch an implementation of the device directory and free list for such a system. In particular, come up with a system where device directory entries and free list cause the minimum amount of disk space to be lost due to table fragmentation, but with the lowest possible transfer (seek+ rotational) latency time.