Review Problems 2

[1] The memory of a system using variable-partitions for memory management is assigned as follows (order starting from lower addresses):

24K assigned to operating system.
400K assigned to process A (which terminates at time= 60)
200K assigned to process B (which terminates at time= 10)
300K assigned to process C (which terminates at time= 50)
100K free

Processes D, E, and F arrive at times 20, 30, and 40, and require 100K, 150K, and 400K of memory respectively. When will each of the new processes be able to run in the cases of best-fit, worst-fit, and first-fit assignment algorithms?

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[2] A system uses variable partitions to manage its 100 Mb memory. It had separate free memory areas of sizes 10, 21, 7, and 15 Mb (lower addresses first). Then, a process started requiring 9 Mb of memory followed by another process requiring 11 Mb of memory.
a) In the cases of best-fit, worst-fit and first-fit assignment, find the size of the largest process that can run next (paging is not used).
b) If minimum memory requirement for any process in the system is 8 Mb, what is the size of memory effectively wasted in the above three cases?

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[3] A system manages a memory of 16M using the buddy allocator system. The following occurred in order:

- Task A starts requesting 3.6 M.
- Task B starts requesting 1.5 M.
- Task C starts requesting 1.2 M
- Task D starts requesting 1.9 M
- Task E starts requesting 2.7 M
- Tasks B and C terminate.
- Task F starts requesting 1.5 M
- Task G starts requesting 1.6 M

How will memory be assigned to these tasks?

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[4] In systems using message passing with synchronous send, can deadlocks occur? What about asynchronous send? If your answer is yes, what modifications can be done to avoid the deadlock state?

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[5] A computer system uses banker's algorithm for deadlock avoidance. This system runs three processes competing for 11 available devices of type 1 and 12 available devices of type 2. Consider the following state:

	Type 1		Type 2	
Process	Assigned	Max.	Assigned	Max.
A	2	3	3	5
B	3	5	4	4
C	4	6	4	5

a) By what amount can the number of available devices of each type be reduced while the above state remains safe?
b) The above initial state was followed by a request from process A for a type 1 device. What will be the system response to this request?

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[6] A FAT volume has a cluster size of 4K bytes. Directory of this volume indicates that the number of the first cluster in the file A.txt is 41 and the first cluster in file B.dat is 49. A part of the FAT of this disk is shown below:

Cluster no	...	40	41	42	43	44	45	46	47	48	49	50	...
FAT entry	...	49	42	43	44	45	46	EOF	free	free	50	EOF	...

a) How much disk space is assigned to file A.txt? How much of this space is wasted if this file contains 22000 bytes of data?
b) Is there an error in the above FAT?
c) If the user reads file A.txt and deletes the last 6000 bytes in this file, rewrite the updated FAT.

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[7] How many disk accesses are required to open the file . /user1/prog in UNIX?

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[8] Free disk space can be kept track of using a free list or a bit map. For a disk with B blocks, of which F are free, state the condition under which the free list uses less space than the bit map, assuming that disk addresses require D bits. For D having the value of 32-bits, express your answer as a percentage of the disk space that must be free.

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[9] a) A UNIX system has a hard disk with a block size of 2 Kbytes. This system keeps track of disk space assignment using i-nodes containing 10 direct pointers as well as pointers for single and double indirect addressing. Assume that block addresses are 4-bytes long.

a) Find the maximum file size in the above disk.
b) If a file of 6221 Kbytes is stored in the above disk, find the corresponding wasted disk space.
c) Assume that the above file is opened and 1567 Kbytes of data are added to it. What is the *total* number of free blocks needed to perform this operation?
