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| **Theory Notes Task: Memory Management** |

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| 1. List the roles of the memory manager  Allocates memory to processes  Maps physical memory locations to the process addresses  Make use of virtual memory  Segment and paginate memory |

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| 2. What is memory segmentation?  Separating the memory into different segments which allows the program to run |

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| 3. A memory segment is further divided into several sections. Draw a diagram to show these sections and label it correctly   |  | | --- | | Stack segment | | Free memory | | Data segment | | Code segment | |

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| 4a. What is the role of the ‘code segment’?  It is where instructions for the process are stored |
| 4b. What is the role of the ‘data segment’?  It is where variables for the process are stored |
| 4c. What is the role of the ‘stack segment’?  The stack segment allows a process to use functions and subroutines |
| 4d. What is the role of the ‘free memory’?  Free memory is allocated memory that allows the stack segment to grow or shrink in size depending on how much size the stack segment needs |

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| 5. State why segments don’t need to be physically next to one another  The operating system is tracking the physical locations of all addresses in memory |

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| 6. What is the role of the memory manager?  Manages memory resources  It gives each process its own segment of memory so that processes do not overwrite each other  It loads and unloads processes from memory  It allows for many processes to run at the same time without interfering with each other and makes the memory management as efficient as possible |

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| 7a. What is virtual memory?  Virtual memory is the use of the hard disk as RAM when RAM becomes full  Overseen by the memory manager |
| 7b. What is the main disadvantage of virtual memory?  It is very slow to access |
| 7c. How does the CPU access data held in virtual memory?  The page with the data that needs to be accessed is loaded into memory while another page that is not being used is unloaded |

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| 8a. What is meant by the term ‘disk thrashing’?  Extensive use of virtual memory which means that lots of time is being spent swapping data between main memory and virtual memory  There is high disk usage |
| 8b. State one solution that help if disk thrashing occurs regularly  Install more RAM |

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| 9a. What is a ‘page’?  A fixed size of memory |
| 9b. How does the memory manager keep track of pages?  Through a page table |
| 9c. What happens to pages when RAM is getting full?  The least used pages are swapped out of main memory and put in virtual memory in the hard disk and then data that is required is swapped in |
| 9d. When is pagination required?  When there is not enough RAM for all the current processes and virtual memory is therefore being used |

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| 10a. State two similarities between segmentation and pagination  They are both ways of splitting up memory  Managed by the memory manager in the OS  They do not physically divide memory |
| 10b. State two differences between segmentation and pagination  Pagination is only used when virtual memory is required  The pages that pagination creates are of a fixed size whereas the segments created through segmentation may vary in size |

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| 11a. What causes a ‘memory leak’  When memory is not flushed out in a program and so the memory manager still thinks that memory that is free is being used |
| 11b. What is often the result of a severe memory leak?  Crashing / Severe slowing of the pc as it runs out of memory |

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| 12. What is meant by a ‘stack overflow’  A stack overflow is when a program calls on many subroutines within each other and the stack segment uses up all the free memory causing the stack overflow.  The program will most likely crash. |