1. (a) Outline **four** objectives of memory management as a function of the operating system. (4 marks)

(b) Explain **two** functions of shell as used in operating systems. (4 marks)

(c) In an operating system a process may go through several states. Outline **six** such process states. (6 marks)

(d) Paging is a significant technique used in memory management. Explain **three** advantages that paging could provide when implemented. (6 marks)

2. (a) Outline **four** types of Direct Memory Access (DMA) transfer mode. (4 marks)

(b) Explain **two** features of the 3rd generation computer operating system. (4 marks)

(c) Explain **two** circumstances under which memory overlay could be implemented in memory management. (4 marks)

(d) When a user program processes a malicious task it causes a threat to the operating system. Explain **four** such threats. (8 marks)

3. (a) Outline the functions of each of the following drivers:

(i) kernel device; (1 mark)

(ii) use mode device; (1 mark)

(iii) block; (1 mark)

(iv) character. (1 mark)

(b) Describe each of the following multiprocessor operating system models:

(i) master-slave; (2 marks)

(ii) symmetric. (2 marks)

(c) Computer operating systems access files using specific mechanism. Explain **three** file access mechanisms that could be used. (6 marks)

(d) RAID storage techniques were introduced to manage the challenges of computer storage. Explain **three** benefits that could be realised from these techniques. (6 marks)

4. (a) Outline **two** types of *job control language* statements used in operating systems. (2 marks)

(b) Explain **two** divisions of addresses generated by the CPU. (4 marks)

(c) Distinguish between *record* and *file* as used in operating systems. (4 marks)

(d) (i) Explain **two** circumstances under which deadlocks could occur in process management. (4 marks)

(ii) In order to achieve device independence, the computer organizes the I/O software in layers. Describe **three** such layers. (6 marks)

2920/105
July 2021

2
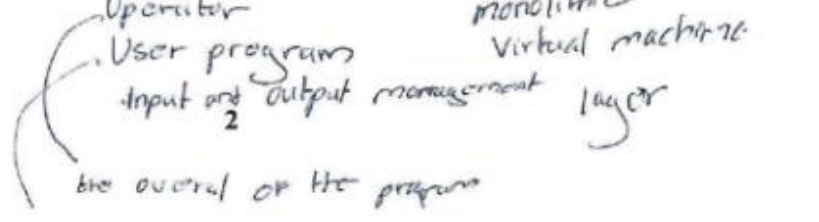
5. (a) Explain each of the following terms as used in I/O devices:

    (i) external interrupt; *is where process ceuze to function due to interrupte by the user.* (2 marks)

    (ii) software interrupt. *is when a process ceure to function since some conditions have not be achieved* (2 marks)

  (b) Differentiate between *deterministic* scheduling and *non-feministic* scheduling algorithms for processes. (4 marks)

  (c) The Manager of ABC Company Ltd. intends to learn about the functions of virtual devices. Explain **two** functions of the device giving an example. (4 marks)

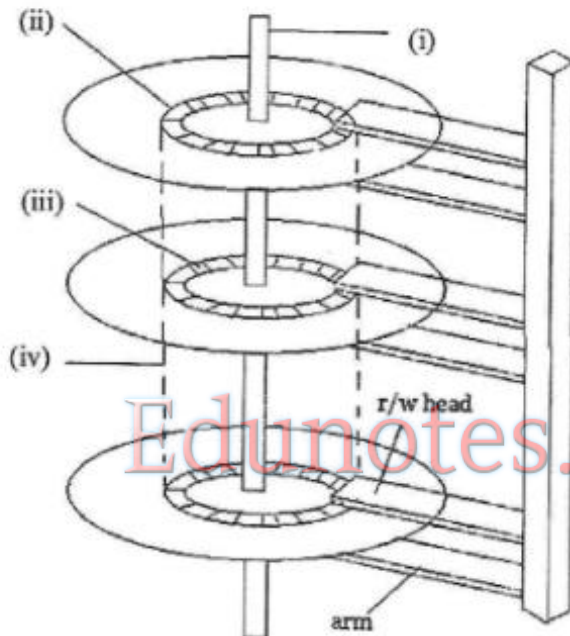 (d) Figure 1 represents the structure of a computer disk. Use it to answer the questions that follow.

Figure 1

    (i) Identify the parts labelled (i), (ii), (iii) and (iv). (4 marks)

    (ii) Explain **two** uses of the R/W head of the computer disk. (4 marks)

6. (a) Explain **two** ways of enforcing *mutual exclusion* in operating systems. (4 marks)

  (b) Distinguish between *multiple-partition allocation* and *single-partition allocation* as applied in computer memory. (4 marks)

  (c) A student intends to study the functions of the dispatcher in process management. Explain **three** such functions. (6 marks)

  (d) (i) Outline **two** types of queues that could be used in process scheduling. (2 marks)

    (ii) Explain **two** circumstance that would lead to *external fragmentation* in computer memory. (4 marks)

7. (a) Outline **four** factors to consider when choosing computer file organization methods. (4 marks)

(b) Distinguish between *static loading* and *dynamic loading* in memory management. (4 marks)

(c) A computer technician intends to list the good qualities of a computer clock to employees in a company. Outline **six** such qualities. (6 marks)

(d) Most computer systems provide directories to aid users in different areas. Explain **three** advantages that users would realize from using these directories. (6 marks)

8. (a) Outline **four** causes of *thrashing* in computer memory management. (4 marks)

(b) Distinguish between *synchronous I/O* and *asynchronous I/O* in computer devices. (4 marks)

(c) A lecturer repaired a faulty computer RAM disk. Explain **two** types of the disks he could have repaired. (4 marks)

(d) Table 1 shows processes in a queue awaiting execution by the scheduler in a round robin scheduling algorithm. Use the information provided to answer the questions that follow.

Process	Burst time	Waiting time
P1	63	
P2	27	
P3	58	
P4	34	

Table 1

(i) Draw a Gantt chart to represent the data in table 1, given quantum time as 20. (4 marks)

(ii) Determine the average waiting time. (4 marks)

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