Q1. (a) A multimedia operating system adopts the Earliest deadline First (EDF) algorithm as its disk scheduling algorithm.

(i) Name four main goals of disk scheduling in a multimedia system. Which of them is different from that of a traditional non-multimedia system?  

(ii) Figure Q1 shows the order of the arrival of a sequence of disk access requests. Derive the order that the requests are served. You are requested to provide the content of the buffer in your derivation.  

(iii) Name two major disadvantages of using the EDF algorithm in disk scheduling.

Q2. (a) A multimedia operating system determines a real-time schedule for the CPU to run two video streams in a real-time system. Both streams are preemptive. Figure Q2 is a timing diagram which shows the arrival of the data of a particular frame of a particular video stream and the deadline for processing the data. In the Figure, \(d_i\), where \(i=\{1,2..6,A,B,C\}\), denotes the deadline of processing frame \(i\). The time required for the CPU to handle a frame is equivalent to the time span of the data transfer of the frame.

(i) Determine the critical instant of playing video streams 1 and 2 if there is any.  

(ii) If the Earliest Deadline First (EDF) algorithm is adopted in the scheduling, sketch a timing diagram which shows how the CPU handles the two video streams.
(iii) If the Rate Monotonic (RM) algorithm is adopted in the scheduling and the sequence of higher request rate has higher priority, sketch a timing diagram which shows how the CPU handles the two video streams.  

(3 marks)

(iv) Classify the EDF and RM algorithms as dynamic or static algorithms.  

(2 marks)

(v) Using the RM and EDF algorithms as examples, elaborate the pros and cons of a static/dynamic real-time scheduling algorithm.  

(3 marks)
Q1 (b) (i) 4 main goals:
- To reduce the cost of seek operations
- To achieve a high throughput
- To provide fair disk access for every process
- To meet the deadlines of all time-critical tasks.

The last one is different.

(ii)

(iii) 2 disadvantages:
- poor throughput
- excessive seek time
Rate monotonic vs. EDF: context switches in preemptive systems

(iv) EDF is dynamic and RM is static.

(v)

<table>
<thead>
<tr>
<th></th>
<th>EDF</th>
<th>RM</th>
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<tbody>
<tr>
<td>Pros</td>
<td>utilization rate of 100%</td>
<td>No scheduling overhead</td>
</tr>
<tr>
<td>Cons</td>
<td>Has scheduling overhead</td>
<td>Utilization rate is low</td>
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(8 marks)

(2 marks)

(3 marks)