**Consider the model described below:**

* New arrivals go to Server 1 or wait in Queue 1
* Jobs leaving server 1 either go to server 2 or wait in Queue 2.

Queue 1

Server 1

Queue 2

Server 2

Calling Population

The following three tables represents the jobs’ inter-arrival times, and service rimes of servers 1 and 2 (all times are in minutes\_.

|  |  |  |
| --- | --- | --- |
| Inter-arrival time | Service time 1 | Service time 2 |
| 6 | 4 | 5 |
| 4 | 2 | 3 |
| 7 | 3 | 6 |
| 2 | 5 | 5 |
| 5 | 2 | 7 |

Four linked lists should be maintained. The lists are

* Events List – head at memory location 5
* Empty List - head at memory location 2
* Queue 1 List - head at memory location 0 (No jobs)
* Queue 2 List - head at memory location 10 (it has two jobs 5 and 7)

**Problem 1: The following table represents the memory area for a simulation system. Find the results of running your simulation system for only one cycle**

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **0** |
| **2** | **0** | **--** | **--** | **11** |
| **3** | **2** | **New Arrival** | **2:22** | **12** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **1** | **New Arrival** | **2:19** | **7** |
| **6** | **0** |  |  | **0** |
| **7** | **3** | **End service 1** | **2:21** | **3** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **End service 2** | **2:35** | **0** |

* Events List – head at memory location 5
* Empty List - head at memory location 2
* Queue 1 List - head at memory location 0 (No jobs)
* Queue 2 List - head at memory location 10 (it has two jobs 5 and 7)

**Solution:**

Next event at location 5: Job 1 at time 2:19

Event type: New Arrival

Two actions will be taken:

1. Generate next arrival (inter-arrival time is 6 minutes)

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **0** |
| **2** | **8** | **New Arrival** | **2:25** | **12** |
| **3** | **2** | **New Arrival** | **2:22** | **2** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **1** |  |  |  |
| **6** | **0** |  |  | **0** |
| **7** | **3** | **End service 1** | **2:21** | **3** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **End service 2** | **2:35** | **0** |

* Events List – head at memory location 7
* Empty List - head at memory location 11
* Queue 1 List - head at memory location 0
* Queue 2 List - head at memory location 10
1. Get job 1 to queue 1 (server 1 is busy and will be free at 2:21))

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **0** |
| **2** | **8** | **New Arrival** | **2:25** | **12** |
| **3** | **2** | **New Arrival** | **2:22** | **2** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **1** | **-** | **-** | **0** |
| **6** | **0** |  |  | **0** |
| **7** | **3** | **End service 1** | **2:21** | **3** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **End service 2** | **2:35** | **0** |

* Events List – head at memory location 7
* Empty List - head at memory location 11
* Queue 1 List - head at memory location 5
* Queue 2 List - head at memory location 10

**Problem 2: The following table represents the memory area for a simulation system. Find the results of running your simulation system for only one cycle**

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **0** |
| **2** | **0** | **--** | **--** | **11** |
| **3** | **2** | **New Arrival** | **2:22** | **12** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **1** | **End Service 1** | **2:19** | **3** |
| **6** | **0** |  |  | **0** |
| **7** | **3** | **--** | **--** | **0** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **End service 2** | **2:35** | **0** |

* Events List – head at memory location 5
* Empty List - head at memory location 2
* Queue 1 List - head at memory location 7
* Queue 2 List - head at memory location 10

**Solution:**

Next event at location 5: Job 1 at time 2:19

Event type: End Service 1

Two actions will be taken:

1. Get job 1 to queue 2 (server 2 is busy and will be free at 2:35))

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **5** |
| **2** | **0** | **--** | **--** | **11** |
| **3** | **2** | **New Arrival** | **2:22** | **12** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **1** | **--** | **--** | **0** |
| **6** | **0** |  |  | **0** |
| **7** | **3** | **--** | **--** | **0** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **End service 2** | **2:35** | **0** |

* Events List – head at memory location 3
* Empty List - head at memory location 2
* Queue 1 List - head at memory location 5
* Queue 2 List - head at memory location 10
1. Get job 3 out of queue 1 to server 1 (service time is 4 minutes)

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **5** |
| **2** | **0** | **--** | **--** | **11** |
| **3** | **2** | **New Arrival** | **2:22** | **7** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **1** | **--** | **--** | **0** |
| **6** | **0** |  |  | **0** |
| **7** | **3** | **End service 1** | **2:23** | **12** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **End service 2** | **2:35** | **0** |

* Events List – head at memory location 3
* Empty List - head at memory location 2
* **Queue 1 List - head at memory location 0**
* Queue 2 List - head at memory location 10

**Problem 3: The following table represents the memory area for a simulation system. Find the results of running your simulation system for only one cycle**

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **0** |
| **2** | **0** | **--** | **--** | **11** |
| **3** | **2** | **New Arrival** | **2:22** | **12** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **1** | **End Service 2** | **2:19** | **7** |
| **6** | **0** |  |  | **0** |
| **7** | **3** | **End service 1** | **2:21** | **3** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **New Arrival** | **2:35** | **0** |

* Events List – head at memory location 5
* Empty List - head at memory location 2
* Queue 1 List - head at memory location 0
* Queue 2 List - head at memory location 10

Solution:

Next event at location 5: Job 1 at time 2:19

Event type: End Service 2

Two actions will be taken:

1. Get job 1 out of system

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **0** |
| **2** | **0** | **--** | **--** | **11** |
| **3** | **2** | **New Arrival** | **2:22** | **12** |
| **4** | **0** | **--** | **--** | **9** |
| **5** | **--** | **--** | **--** | **0** |
| **6** | **0** |  |  | **5** |
| **7** | **3** | **End service 1** | **2:21** | **3** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **--** | **--** | **1** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **New Arrival** | **2:35** | **0** |

* Events List – head at memory location 7
* Empty List - head at memory location 2
* Queue 1 List - head at memory location 0
* Queue 2 List - head at memory location 10
1. Get job 5 out of queue2 to server 2 (service time is 5 minutes)

**Memory Area**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Memory****Location** | **ID** | **Event notice (event type)** | **Event time** | **Next Event** |
| **1** | **7** | **--** | **--** | **0** |
| **2** | **0** | **--** | **--** | **11** |
| **3** | **2** | **New Arrival** | **2:22** | **10** |
| **4** | **0** | **--** | **-** | **9** |
| **5** | **--** | **=** | **--** | **0** |
| **6** | **0** |  |  | **5** |
| **7** | **3** | **End service 1** | **2:21** | **3** |
| **8** | **0** | **--** | **--** | **6** |
| **9** | **0** | **--** | **--** | **8** |
| **10** | **5** | **End service 2** | **2:24** | **12** |
| **11** | **0** | **--** | **--** | **4** |
| **12** | **4** | **New Arrival** | **2:35** | **0** |

* Events List – head at memory location 7
* Empty List - head at memory location 2
* Queue 1 List - head at memory location 0
* Queue 2 List - head at memory location 1