13/01

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**DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION**

**ESE (Reexam)**

**Class: - TE EXTC** **Sem: - VI** **Total Marks: - 100**

**Duration: - 3 Hour** **Subject: - Operating System (ETC605)** **Jan 2020**

1) (a) Discuss the functions and services provided by a typical operating system. [CO1] [10]

Various Components: Kernel, Device Drivers, System Programs

Services:- User Interface, Program execution, I/O operation, File-system manipulation, Communications, Error detection, Resource allocation, Accounting, Protection and security

(b) Define the term process. Hence, list various fields required in the process control block. [CO2] [10]

***Total 8 different fields of PCB (may be nine). Context switching is the major reason for having PCB for each process apart from the individual field requirement.***

2) (a) Consider a following set of processes, with length of CPU bursts given in milliseconds as follows:

| Process | Burst Time | Arrival Time |
|---|---|---|
| P1 | 10 | 0 |
| P2 | 29 | 0 |
| P3 | 3 | 0 |
| P4 | 7 | 0 |
| P5 | 12 | 0 |

Draw the Gantt charts for FCFS, Non Preemptive SJF and RR (Quantum=10)

What is the waiting time of each process for each of the above algorithms?

What is the turnaround time of each process for each of the above algorithms?

Which algorithm results in the minimum average waiting time? [CO2] [10]

OR

Consider a following set of processes, with length of CPU bursts given in milliseconds as follows:

| Process | Burst Time | Arrival Time |
|---|---|---|
| P1 | 14 | 0 |
| P2 | 8 | 0 |
| P3 | 21 | 0 |
| P4 | 10 | 0 |

Draw the Gantt charts for FCFS, Non Preemptive SJF and RR (Quantum=10)

What is the waiting time of each process for each of the above algorithms?

What is the turnaround time of each process for each of the above algorithms?

Which algorithm results in the minimum average waiting time? [CO2] [10]

2) (b) With respect to any typical OS like Linux or Unix OS, Draw and discuss the process state transition diagram. [CO3]

[10]

***Five process states: New, Ready, Running, Blocked, Halted***

***Draw the process state transition diagram with justification.***

3) (a) Discuss the mechanism of translating the virtual address to its respective physical address for a particular operating system. Consider the concept of segmentation. [CO3]

[10]

***Memory is divided into segments. Then a segment can be divided into pages of fixed size.***

***Hence, first describe the concept of segmentation with virtual address definition. [04]***

***Second, describe the segment translation process with diagram. [06]***

OR

Discuss various file allocation methods. [CO3] [10]

***Three Allocation Methods (a) Contiguous (2) Linked (3) Indexed***

***Take an example with diagram representation in each of the three methods for the comparison.***

3) (b) Consider the following page reference string:

7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1

How many page faults would occur for the following replacement algorithms, assuming three page frames? Remember that all frames are initially empty, so your first unique pages will cost one page each.

FIFO

LRU

OPTIMAL [CO2] [10]

4) (a For a typical file systems, list various file attributes and file operations. [CO2] [10]

File Attributes:- Name, Identifier, Size, Type, Location, Protection, Time-Date-User-Identifier [5]

File Operations:- Create, Write, Read, Reposition, Delete, Truncate [5]

4) (b) List and compare FCFS, SSTF SCAN and C-SCAN disk scheduling algorithms. [CO2] [10]

***Four algorithms (a) FCFS (b) SSTF (c) SCAN (d) C-SCAN***

***Take an example with diagram and table for calculating the seek time in each of the four algorithms for the comparison.***

5) (a) In an embedded system, there are two types of scheduling algorithms viz static and Dynamic. Compare these two algorithms. [CO3] [10]

5) (b) Consider a system with three tasks, which we'll call Task 1, Task 2 and Task 3. Assume all are periodic tasks with periods T1, T2 and T3. Each has a deadline that is the beginning of its next cycle.

Task 1 has P1 = 4 ms, C1 = 1 ms, Task 2 has P2 = 10 ms, C2 = 2 ms and Task 3 has P3 = 15 ms, C3 = 4 ms. Consider static priority scheduling (RMA), draw the time space diagram and calculate processor utilization, schedulability. [CO3] [10]

Ans 5(a):

One major limitation of fixed-priority scheduling is that it is not always possible to fully utilize the CPU.

Static (RMA) only guarantees feasibility at 69% utilization, EDF guarantees it at 100%

Dynamic (EDF) is complicated enough to have unacceptable overhead

Dynamic More complicated than RMA: harder to analyze, Less predictable: can't guarantee which process runs when

Dynamic algorithm behaves unpredictably at overloads, and suffers more from overloads than Static (RMA)

Ans 5(b):

U (schedule bound) = 0.779, Ui (utilization) = 0.7166 i.e Ui < U and is definitely schedulable.

Task1 Priority > Task2 Priority >Task3 Priority

| Process | Burst Time | Arrival Time | Priority | FCFS | | Non Pre-SJF | | ---- | | RR (Q=10) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TW | TA | TW | TA | --- | ---- | TW | TA |
| P1 | 10 | 0 | --- | 0 | 10 | 10 | 20 | --- | --- | 0 | 10 |
| P2 | 29 | 0 | --- | 10 | 39 | 32 | 61 | --- | --- | 32 | 61 |
| P3 | 3 | 0 | --- | 39 | 42 | 0 | 3 | --- | --- | 20 | 23 |
| P4 | 7 | 0 | --- | 42 | 49 | 3 | 10 | --- | --- | 23 | 30 |
| P5 | 12 | 0 | --- | 49 | 61 | 20 | 32 | --- | --- | 40 | 52 |
| Average value = | | | | 28 | | 13 | | --- | | 23 | |

| Process | Burst Time | Arrival Time | Priority | FCFS | | Non Pre-SJF | | --- | | RR (Q=10) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TW | TA | TW | TA | --- | --- | TW | TA |
| P1 | 14 | 0 | --- | 0 | 14 | 18 | 32 | --- | --- | 28 | 42 |
| P2 | 8 | 0 | --- | 14 | 22 | 0 | 8 | --- | --- | 10 | 18 |
| P3 | 21 | 0 | --- | 22 | 43 | 32 | 53 | --- | --- | 32 | 53 |
| P4 | 10 | 0 | --- | 43 | 53 | 8 | 18 | --- | --- | 28 | 38 |
| Average = | | | | 19.75 | | 14.5 | | --- | --- | 24.5 | |

Q.4 (b)

**FCFS:-**

| Current Cylinder | Next Cylinder | Total Cylinder Travel |
|---|---|---|
| 53 | 98 | 45 |
| 98 | 183 | 85 |
| 183 | 37 | 146 |
| 37 | 122 | 85 |
| 122 | 14 | 108 |
| 14 | 124 | 110 |
| 124 | 65 | 59 |
| 65 | 67 | 2 |
| | | **640** |

**SSTF:-**

| Current Cylinder | Next Cylinder | Total Cylinder Travel |
|---|---|---|
| 53 | 65 | 12 |
| 65 | 67 | 2 |
| 67 | 37 | 30 |
| 37 | 14 | 23 |
| 14 | 98 | 84 |
| 98 | 122 | 24 |
| 122 | 124 | 2 |
| 124 | 183 | 59 |
| | | **236** |

**SCAN:-**

| Current Cylinder | Next Cylinder | Total Cylinder Travel |
|---|---|---|
| 53 | 65 | 12 |
| 65 | 67 | 2 |
| 67 | 98 | 31 |
| 98 | 122 | 24 |
| 122 | 124 | 2 |
| 124 | 183 | 59 |
| 183 | 199 | 16 |
| 199 | 37 | 162 |
| 37 | 14 | 23 |
| | | **331** |

**C-SCAN:-**

| Current Cylinder | Next Cylinder | Total Cylinder Travel |
|---|---|---|
| 53 | 65 | 12 |
| 65 | 67 | 2 |
| 67 | 98 | 31 |
| 98 | 122 | 24 |
| 122 | 124 | 2 |
| 124 | 183 | 59 |
| 183 | 199 | 16 |
| 199 | 0 | 199 |
| 0 | 14 | 14 |
| 14 | 37 | 23 |
| | | **382** |

Q.3 (b)

| 7 | | 0 | | 1 | | 2 | | 0 | | 3 | | 0 | | 4 | | 2 | | 3 | | 0 | | 3 | | 2 | | 1 | | 2 | | 0 | | 1 | | 7 | | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

FIFO (Page Faults = 15)

| 7* | | 7* | | 7* | | 2 | | 2 | | 2 | | 2* | | 4 | | 4 | | 4* | | 0 | | 0 | | 0 | | 0 | | 0* | | 0* | | 0* | | 7 | | 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | | 0 | | 0* | | 0* | | 3 | | 3 | | 3* | | 2 | | 2 | | 2* | | 2* | | 2* | | 1 | | 1 | | 1 | | 1 | | 1* | | 0 | |
| | | | | 1 | | 1 | | 1 | | 1* | | 0 | | 0 | | 0* | | 3 | | 3 | | 3 | | 3 | | 3* | | 2 | | 2 | | 2 | | 2 | | 2* | |

LRU (Page Faults = 12)

| 7* | | 7* | | 7* | | 2 | | 2 | | 2* | | 2* | | 4 | | 4 | | 4* | | 0 | | 0 | | 0* | | 1 | | 1 | | 1* | | 1 | | 1 | | 1* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | | 0 | | 0* | | 0 | | 0 | | 0 | | 0* | | 0* | | 3 | | 3 | | 3 | | 3 | | 3* | | 3* | | 0 | | 0 | | 0* | | 0 | |
| | | | | 1 | | 1 | | 1* | | 3 | | 3 | | 3* | | 2 | | 2 | | 2* | | 2* | | 2 | | 2 | | 2 | | 2* | | 7 | | 7 | | | |

OPTIMAL (Page Faults = 9)

| 7* | | 7* | | 7* | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | 2* | | 2* | | 2* | | 7* | | 7* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | | 0 | | 0 | | 0 | | 0* | | 4* | | 4* | | 4* | | 0* | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | | |
| | | | | 1 | | 1* | | 1* | | 3* | | 3 | | 3 | | 3 | | 3 | | 3* | | 3* | | 1* | | 1 | | 1 | | 1 | | 1 | | 1 | | | |