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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree (S,FE) Examination June 2022 (2015 scheme)

Course Code: CS204

Course Name: OPERATING SYSTEMS (CS)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each carries 3 marks.

1 What do you understand by degree of multiprogramming? How a medium-term scheduler controls the degree of multiprogramming? (3)

2 Write the benefits of microkernel structure. (3)

3 Write the output of the following code. (3)

[*Assume that the Process ids of the parent and child are 1100 and 1200, respectively. Also assume proper header files are included and fork() system call return with success.*]

```
int main(void) {  pid_t pid;  pid = fork();  printf ("P id = %d\t", pid);    return 0; }
```

4 Write the three different ways for the implementation of temporary queues used with interprocess communication. (3)

PART B

Answer any two questions. Each carries 9 marks.

5 Write notes on (i) Client-Server Computing (ii) Cloud Computing (iii) Peer-to-Peer Computing (9)

6 a) Point out the major categories of system calls provided by an operating system and the important system calls in each category. (5)

b) What do you understand by context switching? Point out why context switch time is said to be a pure overhead to the system? (4)

7 a) Explain how an ordinary pipe is used by processes for message passing. (5)

b) How sockets are used for communication between two processes? (4)

PART C

Answer all questions. Each carries 3 marks.

8 Compare preemptive kernels with nonpreemptive kernels. (3)

9 Write the syntax of a monitor. (3)

10 State the major drawback of priority scheduling algorithm. How can it be solved? (3)

11 Resource pre-emption is a method to recover from a deadlock. But certain issues to be addressed. List out them. (3)

PART D

Answer any two questions. Each carries 9 marks.

12 Using appropriate examples, describe the three requirements that a solution to the critical section problem must satisfy. (9)

13 a) Illustrate how semaphore can be used effectively to solve critical section problem meeting all the requirements. (4)

b) Consider a system that consist of four process namely P0, P1, P2, P3 and four resources A, B, C, D each having single instance. At time t_1, A is allocated to P1 and P1 is waiting for B. B is allocated to P2 and P2 is waiting for C. C is allocated to P3. In future P0, P1, P3 may request for resource D. At time t_2, P3 made a request for D. Using Resource-Allocation Graph algorithm, check whether this request can be granted immediately . Justify your answer. (5)

14 Draw the Gantt Chart, find the average waiting time for the processes given in the following table using the following algorithms: (9)

i) SJF ii) SRTF iii) RR (time slice = 4 ms)

Process	Arrival Time (ms)	CPU Cycle (ms)
1	0	10
2	2	6
3	3	4
4	6	2
5	10	8

PART E

Answer any four questions. Each carries 10 marks.

15 a) With the help of a diagram explain how logical address is translated to physical address in case of segmentation scheme. (6)

b) Consider the following segment table of a process. (4)

Segment	Limit	Base
0	200	3400
1	310	1500
2	150	2700

Compute the resultant physical address for each of the following logical addresses.

(i) 1, 242 (ii) 0, 250 (iii) 2, 0 (iv) 0,0

16 a) Explain how memory protection is employed in contiguous memory allocation scheme. (4)

b) Consider a simple paging system with 4KB page size and a page table with each entry of size 4 bytes. Answer the following questions. (6)

(i) What is the size of the physical memory (in bytes) that can be addressed?

(ii) Howmany bits are used for representing the page offset value?

(iii) Calculate the amount of internal fragmentation for a process of size 115KB, assuming that enough free frames are available.

(iv) Is it possible to load a process of size 41KB if there are 10 free frames. Justifiy your answer.

17 For the page reference string 5 9 4 5 3 7 5 1 4 5 7 2 3 4 5, calculate how many page faults will occur for the following page replacement algorithms with four page frames. (10)

(i) LRU (ii) Optimal page replacement (iii) FIFO

18 Illustrate the following file allocation methods showing the content of directory and allocated blocks for a file system with 16 blocks (numbered 0 to 15) (10)

(i) Contiguous allocation for a file "f1.dat" containing 3 blocks starting with block number 12.

(ii) Linked allocation for a file "f2.dat" containing blocks 7, 10, 4, 8.

(iii) FAT allocation scheme for a file "f3.dat" cotaining blocks 7,10,4,8.

(iv) Indexed allocation for a file "f4.dat" with blocks 7,10,4,8. Index block used is block 2.

19 a) List out the advantages and disadvantages of Solid State Devices when compared with magnetic disks. (4)

b) Consider a system with 4 domains (D1,D2,D3,D4) and 5 objects(three files- {F1,F2,F3} , one printer and one scanner). A process executing in D1 can read (6)

files F1 and F3. A process in D4 has same previledge as one executing in D1 and in addition it can also write onto files F1 and F3. Printer and scanner can be accessed only by processes in D2. Process in D3 has permission to read F2 and execute F3. A process executing in D2 can switch to D3 or D4. A process in D4 can switch to D1 and one in D1 can switch to D2. Draw the access matrix showing all the above protection details.

20 Assume that a magnetic disk has 400 cylinders (numbered 0 to 399). The current position of the head is at cylinder 120. The request queue is 80, 130, 60, 230, 100, 300, 250, 170. Draw the head movement in each of the following disk scheduling algorithms and compute the total head movement in each case: (10)

(i) SSTF (ii) SCAN (iii) LOOK

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