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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S2 (PT) (S) Examination January 2024 (2019 Scheme)

Course Code: CST 206
Course Name: OPERATING SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1		Define Operating System. Mention its purpose and objectives.	3
2		Which are the three methods used to pass parameters to operating system?	3
3		With a figure, explain how process is created using fork () system call?	3
4		What is the use of Process Control Block (PCB) in operating system?	3
5		What is meant by critical section? What is critical section problem?	3
6		Explain with an example, how *wait for* graph is used to detect deadlocks?	3
7		Does paging suffer from fragmentation? Justify your answer.	3
8		Consider a logical address space of 64 pages with 1024 bytes per page mapped to a physical memory of 256 frames. Calculate the (i) Number of bits required for logical address. (ii) Number of Bits required for physical address.	3
9		Define the terms i) Seek time ii) Rotational delay iii) Disk bandwidth.	3
10		Briefly explain about file attributes.	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Explain the features of single processor, multiprocessor and clustered systems?	9
	b)	What do you understand by system calls? List and explain the system calls used in process control.	5
12	a)	Describe the services provided by an operating systems in detail.	9
	b)	With a figure, explain the microkernel architecture?	5

Module -2

13	a)	Draw the Gantt Chart, Calculate the average waiting time and average turnaround	9

time for the processes given in the table, using the following algorithms:

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

Process	Arrival Time (ms)	CPU Burst Time(ms)
P1	0	10
P2	2	6
P3	3	4
P4	6	2
P5	10	8

b) What is a process? With the help of a diagram, explain the different process states. 5

14 a) Discuss briefly the various issues involved in implementing Inter Process Communication (IPC) in message passing system. 8

b) Describe the differences among short-term, medium-term and long term scheduling. 6

Module -3

15 a) Discuss about any two classic problems of synchronization. How producer consumer problem is solved using semaphores? 8

b) Describe the various methods of recovery from deadlocks. 6

16 a) Consider the following snapshot of a system with five processes P1, P2, P3, P4, P5 and four resources A,B,C,D. Using Bankers Algorithm, find the following 10

i) How many resources of type A, B, C, D are there?

ii) Calculate the Need Matrix.

iii) Is system is safe state? If yes, find the safe sequence?

iv) If the request from P2 arrives for (0, 3, 2, 0), Can the request be immediately granted?

Process	Allocation	Max	Available
	A B C D	A B C D	A B C D
P1	0 0 1 2	0 0 1 2	1 5 2 0
P2	1 0 0 0	1 7 5 0	
P3	1 3 5 4	2 3 5 6	
P4	0 6 3 2	0 6 5 2	
P5	0 0 1 4	0 6 5 6	

b) Describe how the compare_and_swap () instructions can be used to provide mutual exclusion that satisfies the bounded waiting requirement. 4

Module -4

17 a) Explain the First-fit, Best-fit, and Worst-fit algorithms for contiguous memory allocation. 8

b) With a diagram, write the steps involved in handling a page fault. 6

18 a) Consider the reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. Assuming demand paging with 3 frames, how many page faults would occur for:- 9

i) FIFO replacement algorithm

ii) Optimal replacement algorithm

iii) LRU replacement algorithm

What is the hit Ratio for the above algorithms?

b) Differentiate between Internal Fragmentation and External Fragmentation. 5

Module -5

19 a) Discuss the concept of Virtual File Systems? 8

b) Explain how access matrix is used as a protection mechanism. 6

20 a) 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, and 170. Draw the head movement in each of the following disk scheduling algorithms and compute the total head movement in each case: 9

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

b) What are the different access methods of files? How are they implemented? 5

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