Hall Ticket Number:

Code No. : 15660 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (I.T.) V-Semester Main & Backlog Examinations, Jan./Feb.-2024

Operating Systems

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define operating system. Draw an abstract view of components of the computer system.	2	1	1	1

2.	Write the output of the following code:
	#include <stdio.h>
	#include <unistd.h>
	
	int main()
	{
	if (fork() && (!fork())) {
	if (fork() || fork()) {
	fork();
	}
	}
	printf("2 ");
	return 0;
	}
		2	3	1	2

3.	What is compaction (in the context of memory management)? Under what circumstances it is not possible?	2	2	2	1
4.	Discuss the purpose of paging the page table.	2	1	2	1
5.	Define Semaphore and discuss the operations performed on semaphores. State the applications of Semaphore in operating system.	2	1	3	1
6.	Write Petersons solution for process synchronization. What is its limitation?	2	2	3	1
7.	Differentiate between RAID Level 0 and RAID Level 1.	2	2	4	2
8.	State the advantages and disadvantages of the variant of Linked Allocation that uses a FAT to chain together the blocks of a file?	2	2	4	1
9.	When a windows system hibernates, the system is powered off. Suppose you have changed the CPU or date on a hibernating system. Do you think that would work? Why or why not	2	2	5	1
10.	How does LINUX protect its users and files?	2	1	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	Explain various process states with a neat diagram?	3	2	1	1

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b) Consider the following set of processes, with the length of the CPU burst given in milliseconds: | 5 | 3 | 1 | 2

Process	Burst Time	Priority	Arrival Time
P1	12	3	0
P2	6	4	2
P3	4	1	4
P4	18	2	6

Draw Gantt charts and calculate average turnaround time and average waiting time of these processes using the following scheduling algorithms:

a) FCFS, b) SJF-Preemptive,

c) Priority (smaller priority number implies a higher priority),

d) Round Robin with time quantum of 5-time units and the processes are assumed to have arrived in the order P1, P2, P3, P4 all at time 0.

12. a) Explain various contiguous memory allocation techniques. | 3 | 2 | 2 | 1

b) Suppose that the virtual address space has eight pages and physical memory with four page frames. Find the number of page faults occur with the reference string. 0 2 1 3 5 4 6 3 7 4 7 3 3 5 5 3 1 1 1 7 2 3 4 1 using | 5 | 3 | 2 | 2

a. FIFO page replacement. b. Optimal page replacement.

c. LRU page replacement.

Which of the above page replacement suffers with Belady's anomaly?

13. a) You have been hired by Greenpeace Organization to help the environment. Because unscrupulous commercial interests have dangerously lowered the whale population, whales are having synchronization problems in finding a food mate. The trick is that in order to have food, three whales are needed, one younger, one elder, and one foodpicker. Your job is to write the three procedures younger(), elder(), and foodpicker(). Each whale is represented by a separate process. A younger whale calls younger(), which waits until there is a waiting elder and foodpicker. Similarly, a elder whale must wait until a younger whale and a foodpicker are present. Once all three are present, all three are returned. Solve the above scenario using semaphores. | 4 | 4 | 3 | 2

b) Consider the following snapshot of the system | 4 | 3 | 3 | 2

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

a) Calculate Need.

b) Is the system safe or not.

c) If the Request-(0, 4, 2, 0) is made by process p1, should the request be granted or not. Justify.

14. a) Explain various techniques implemented for free space management, discuss with suitable examples. | 4 | 2 | 4 | 1

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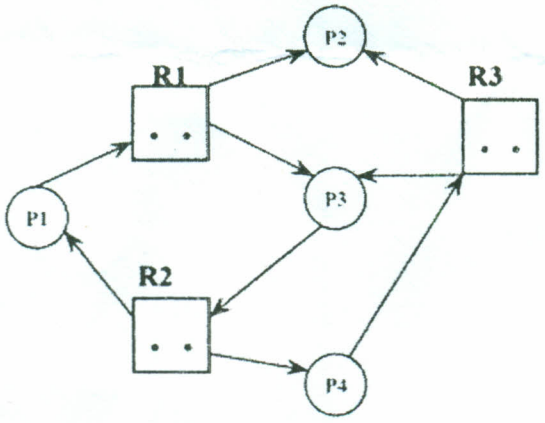
b)	Suppose that a disk drive has 3,000 cylinders, numbered 0 to 2,999. The drive is currently serving a request at cylinder 2,150, and the previous request was at cylinder 1,805. The queue of pending requests, in FIFO order, is: 2,069; 1,212; 2,296; 2,800; 544; 1,618; 356; 1,523; Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms? a. FCFS b. SCAN c. C-SCAN d. LOOK	4	3	4	2
15. a)	Explain how the kernel implements process scheduling in Windows10.	4	2	5	1
b)	Explain Completely Fair Scheduler and real time scheduling in Linux OS.	4	2	5	1
16. a)	What are the five major activities of an operating system with regard to file management? Write appropriate system calls for file operations in Linux OS.	4	1	1	1

b)	Consider the two dimensional array A: int A[ ] [ ] = new int [50] [50] where A[0] [0] is at location 400, in a paged system with pages of size 400. A small process is in page 0 (locations 0 to 399) for manipulating the matrix; thus, every instruction fetch will be from page 0. For three page frames, how many page faults are generated by the following array initialization loops, using LRU replacement, and assuming page frame 1 has the process in it, and the other two are initially empty:
	for (int j = 0; j < 50; j++)
	for (int i = 0; i < 50; i++)
	A[j][i] = 0;
		4	3	2	2

17.	Answer any ***two*** of the following:				
a)	Define deadlock and necessary conditions for deadlock. Consider the following Resource Allocation Graph and justify the reasons stating whether it has deadlock or not?  	4	3	3	2
b)	Discuss access matrix and the different methods for modifying the access matrix.	4	1	4	1
c)	How does the NTFS directory structure differ from the directory structure used in UNIX operating system.	4	2	5	2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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