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Question Paper Code: R3H04

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Cyber Security

R21USY304 OPERATING SYSTEM AND SECURITY

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10 x 2 = 20 Marks)

1. Outline the functions of Clustered systems CO1-U
2. Is OS a resource Manager? If so justify your answer. CO2-App
3. Examine the concept of a context switch. CO1-U
4. Given 3 processes A,B and C, three resources x, y and z and following events, a. CO2-App
A requests x ii) A requests y iii) B requests y iv) B requests z v) C requests z vi)
C requests x vii) C requests y Assume that requested resources should always be
allocated to the request process if it is available. Draw the resource allocation
graph for the sequences. And also mention whether it is a deadlock? If it is, how
to recover the deadlock
5. What is swapping and how swapping impacts system performance. CO1-U
6. Will optimal page replacement algorithm suffer from Belady's anomaly? Justify CO2-App
your Answer.
7. A network-facing component of the TCB receives requests from untrusted CO2-App
sources. Write two potential countermeasures that could be implemented to
protect this component
8. What is the concept of a Trusted Computing Base (TCB)? CO1-U
9. List What is Address Space Layout Randomization (ASLR) and its role in CO1-U
operating system security.
10. What are the methods that can be used to identify and address Windows CO1-U
Vulnerabilities?

PART – B (5 x 16= 80 Marks)

11. (a) Explain in detail operating systems design and implementation. CO1-U (16)
- Or
- (b) Explain in detail about the Kernel data structures. CO1-U (16)
12. (a) Consider the set of 5 processes whose arrival time and burst time are given below- CO2-App (16)

Process Id	Arrival time	Burst time
P1	3	1
P2	1	4
P3	4	2
P4	0	6
P5	2	3

If the CPU scheduling policy is SJF Non-preemptive and Round Robin (with Time quantum=2 units), Explain the procedure in steps and also calculate the average waiting and average turnaround time along with the Gantt chart.

Or

- (b) Assume that there are 5 processes, P0 through P4, and 4 types of resources. At T0 we have the following system state: CO2-App (16)
- Max Instances of Resource Type A = 3 (2 allocated + 1 Available)
 ,Max Instances of Resource Type B = 17 (12 allocated + 5 Available),
 Max Instances of Resource Type C = 16 (14 allocated + 2 Available),
 Max Instances of Resource Type D = 12 (12 allocated + 0 Available).
 Find out whether it is in safe state.

Given Matrices												
	<u>AllocationMatrix</u> (No of the allocated resources by a process)				<u>MaxMatrix</u> (Max resources that may be used by a process)				<u>Available Matrix</u> (Not Allocated Resources)			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	1	1	0	0	2	1	0	1	5	2	0
P1	1	2	3	1	1	6	5	2				
P2	1	3	6	5	2	3	6	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				
Total	2	12	14	12								

13. (a) Given memory partitions of 100 K, 500 K, 200 K, 300 K and 600 K (in order) how Would each of the first fit, best fit and worst fit algorithms work place processes of 212 K, 417K, 112 K and 426 K (in order)? Which algorithms make the most efficient use of memory and Explain the procedure as steps? CO2-App (16)
- Or
- (b) Calculate page faults for (LRU, FIFO, OPT) for following sequences CO2-App (16)
where page frame is three. 0,1,2,1,4,2,3,7,2,1,3,5,1,2,5.
14. (a) Explain in detail Bell LaPadula Model with Examples. CO1-U (16)
- Or
- (b) Explain the concept of a threat model and its importance in secure CO1-U (16)
operating system design.
15. (a) Explain the concept of a Security Kernel and its role in maintaining CO1-U (16)
the integrity of an operating system.
- Or
- (b) Explain the significance of Windows Authorization in controlling CO1-U (16)
access to sensitive data and resources in detail.

