Operating System Question Bank

UNIT-1

1. Differentiate between process and thread. (or) What resources are used when a thread is created and how do they differ from those used when a process is created. (2/5M) ( V V IMP)
2. Explain about process states and process transition diagram. (or) Draw the state diagram of a process from its creation to termination (or) Discuss the various states in which a process can exist with the help of a state diagram (5m/10m) (V V IMP)
3. Write about inter process communication.(or)Explain two models of inter process communication

(or) Describe about inter process communication mechanisms in detail with block diagrams. (2m/5m/10m) (V IMP)

1. Practice all the problems of CPU scheduling algorithms discussed in class (10m)(V V V IMP)
2. What is a thread? Explain different types of thread. Explain threading models. (or) Mention the components in a multi thread process that share across the threads. (or) Describe the actions taken by a thread library to context switch between user level threads. (V V IMP)
3. What is PCB? Explain the purpose of PCB. (or) Draw a neat diagram of PCB.(2/4/5m) (V IMP)
4. What are semaphores? Explain different types of Semaphores with examples. (or) What is Semaphore? Explain how it is used to solve the critical section problem with example. (or) Define semaphore. What are its limitations? (or) What is a semaphore? List the operations that can be performed on semaphore. (or) What is a semaphore? Explain a binary semaphore with the help of an example? (or) How are counting semaphores different from binary semaphores?(2/4/5m) (V V IMP)
5. Define the following terms:(2/3/4m each) (V V IMP)
6. Multiprogramming
7. Multitasking or Time sharing
8. Multiprocessing
9. Real Time Systems
10. CPU utilization
11. Throughput
12. Waiting time
13. Explain all three problems of classical problem of synchronization (producer-consumer, reader-writer, dining philosopher). (or) Explain the reader-writer problem of synchronization and explain the semaphore solution for it. (or) What is dining philosophers problem?(5/10m) (V V V IMP)
14. Explain resource allocation graph with example.(2/4/5m) (V IMP)
15. What are the necessary conditions for deadlock to occur?(2/3m) (V IMP)
16. Explain deadlock prevention techniques. (or) Explain the protocols used for deadlock prevention (3/4/5m) (V IMP)
17. Explain deadlock avoidance in detail. (or) With a suitable example, explain the deadlock avoidance algorithms for a system with multiple instances of an each resource type.(5m) (V IMP)
18. Explain banker’s algorithm with example (or) Explain Deadlock avoidance by using Bankers Algorithm with an example. (Practice all problems discussed in class)(10m) (V V V IMP)
19. Explain how to recover from deadlock. (or) List and explain the methods used for deadlock recovery.(5m) (V IMP)
20. Discuss multilevel queue and multilevel feedback queue scheduling algorithm.(5/10m) (V IMP)
21. Explain critical section problem. (2m/5m) (V V IMP)
22. What is a System call? Give any two examples. (or) What is the difference between system programs and system calls? (2m/5m) (V IMP)
23. Define race condition with an example. (or) When does a ‘race condition’ occur?(2/3m) (V IMP)
24. What is starvation and aging? (or) Define starvation and how this problem can be solved. (2/3/4/5m) (IMP)
25. What is the criterion used to select a scheduling algorithm? (or) Discuss the criteria used to evaluate the CPU scheduling algorithms (3/4/5m) (IMP)
26. What are the strategies to handle deadlocks? (or) Explain about the various methods for handling deadlocks.(3/4/5m) (IMP)
27. What is an Operating System? Give the major goals of operating systems. (or) Define Operating system.(2/3/4/5m)
28. Briefly describe the services and functions provided by an operating system and discuss how they differ. (3/4/5/10m)
29. Explain operating system structure. (3/4/5/10m)
30. Why operating system is known as a resource allocator? (2/3m)
31. Operating system performs resource preemption for the CPU and memory but not for I/O devices. Why is it so? (3/4/5m)
32. Describe the various activities performed by operating system in connection with process management. (3/4/5m)
33. Explain the virtual machine view of an operating system. (or) What is the main advantage for an operating system designer for using virtual machine architecture? (2/3/4m)
34. Describe the essential properties of the Real Time and Distributed Operating System. (or) Explain the features necessary to implement real time operating systems. (3/4m)
35. Describe the difference between symmetric and asymmetric multiprocessor. (2/3/4m)
36. What are the advantages of remote procedure calls over regular message passing? (2/4m)
37. What is the purpose of command mode interpreter? (2/3m)
38. Differentiate between policy and mechanism. (2/3/4m)
39. What is dual mode operation? (2/3m)
40. Explain context switching with a neat diagram. (2/3/4m)
41. Explain the role of schedulers with a help of a process transition diagram. (5m)
42. Why it is important for the scheduler to distinguish I/O bound programs from CPU-bound programs? (2/3/4m)
43. Differentiate between preemptive and non preemptive scheduling algorithm. (2/3/4m)
44. What is a preemptive shortest job first algorithm? (2m)
45. Write about Pthreads(2/3m)
46. Explain about the concept of multithreading in detail (or) Differentiate between single threaded and multithreaded process (3/4/5m)
47. How process synchronization is achieved through Hardware instructions.(2/3/4m)
48. Explain wait () and signal() system calls (2/3m)
49. What is a monitor? (or) Give the structure of monitor. (or) Discuss monitors with Dining philosophers problem.(2/3/4/5m)
50. How is the “Condition construct” useful in the monitor synchronization schemes? (2/3m)
51. State 3 ways to implement mutual exclusion in operating system. (3m)
52. Explain deadlock detection techniques. (or) Explain deadlock detection algorithm for single instance of each resource type.(4/5m)
53. Write the differences between deadlock prevention and avoidance. (2/3m)
54. List and explain the three events concerning resource allocation. Define the following: a) Deadlock b) Resource request and allocation graph (RRAG) c) Wait for graph (WFG) (5m)

UNIT-2

1. Explain segmentation of memory management with neat diagram. (or) What is paging and segmentation (or) Explain paged Segmentation with an example. (or) Differentiate between paging and segmentation in detail. (5/10m) (V V V IMP)
2. Explain all page replacement algorithms.(Practice all problems discussed in class) (10m) (V V V IMP)
3. Explain internal and external fragmentation. (or) What is a fragmentation? (2/4/5m) (V IMP)
4. Explain paging with neat diagrams/ Examples. (5m) (V IMP)
5. What is thrashing? Give solutions for it. (or) Define Thrashing. List the methods used to work with thrashing. (2/3/4/5m) (V V V IMP)
6. What is Virtual memory and explain about demand paging. (or) Explain demand paging with neat diagram. (2/3/4/5m) (V IMP)
7. Explain Belady’s anomaly with example. Why does it only occur in FIFO? (or) Compare the performance of the optimal page replacement algorithm and the LRU page replacement algorithm with a suitable example and explain Belady’s anomaly. (or) Explain Belady’s anomaly and justify why LRU page replacement does not suffer from the same. (5m) (V V IMP)
8. Problem on First fit / Best fit / Worst fit hole allocation methods (5m) (V IMP)
9. Explain the concept of variable-partition contiguous storage allocation. (4/5m) (IMP)
10. Explain the difference between Logical and physical address space. (2/3/4m)
11. Discuss two main approaches to identify and reuse free memory area in a heap. (Ans: First fit, Best Fit) (2/3/4m)
12. Illustrate how address protection is achieved using base and limit registers.(2/3m)
13. What is the significance of page-table? Explain the structure of a page-table (2/4/5m)
14. Write short notes on Inverted paging/ Inverted page table (2/3/4m)
15. Why are Translation Look-aside Buffers (TLBs) important? In a simple paging system, what information is stored in a typical TLB table entry? (4/5m)
16. Explain Copy-on-write principle. (2m)
17. What is a page fault? (2m)
18. What is a dirty bit? (2m)
19. What is an I/O buffer? What is the advantage of buffering? Is buffering always effective? Justify your answer with help of an example. (2/4m)
20. What is the use of a working–set window? (2/3m)

UNIT-3

1. List / explain the various methods used for file access. (2/3/4/5m) (V V IMP)
2. Explain disk scheduling algorithms with examples. (5/6/7/10m) (V V V IMP)
3. Explain RAID structure in detail.(or) What is RAID? What are its advantages? (or) How the reliability and performance are increased using RAID structure? (or) Explain the levels of RAID with a neat diagram. (3/4/5/10m) (V V V IMP)
4. Enlist the different file allocation methods to effectively utilize the disk space. (or) Discuss various file allocation methods. (5m/10m) (V IMP)
5. Explain directory implementation. (or) Discuss various directory structures with suitable examples. (5m) (V IMP)
6. List the methods used for free space management. (or) How can linked lists be used for “Free-space Management”? (or) Write short notes on free space allocation techniques. (2/4/5m) (V IMP)
7. Write short notes on streams (2/3/4/5m) (V V IMP)
8. Write about file control block. (or) What are main contents of FCB? (2/3/4/5m) (V V IMP)
9. Describe the steps with a neat flow chart for transforming I/O request to hardware operations.(3/4/5m) (V IMP)
10. Write in detail about DMA. (or) How does DMA increase system concurrency? How does it complicate hardware design? (3/4/5m) (V IMP)
11. What is file-system mounting? (2/3/4m) (V IMP)
12. Differentiate between maskable and non maskable interrupts and give examples for each.(3/4m) (IMP)
13. What do you understand by Rotational latency? (2/3/4m) (IMP)
14. Explain the purpose of stable storage (2/3/4m) (IMP)
15. Explain kernel I/O subsystem. (2/3/4m) (IMP)
16. How is the reliability by redundancy obtained in disks? (2/3/4m) (IMP)
17. Differentiate between blocking and non blocking I/O. (2/3/4m) (IMP)
18. Explain the advantages and disadvantages of contiguous vs. linked file allocation policies. (2/3/4m) (IMP)
19. Differentiate random and sequential access of a file. (2/3/4m) (IMP)
20. Write short notes on swap space management (2/3/4m) (IMP)
21. What are the various kinds of performance overheads associated with servicing an interrupt? (2/3/4m)
22. What are implications of supporting UNIX consistency semantics for shared access for those files that are stored as remote files system? (2/3/4m)
23. What are the properties of immutable files? (2m)
24. What problems could occur if a system allowed a file system to be mounted simultaneously at more than one location? (2/3m)
25. Why file name extensions are used? (2/3m)
26. What are atomic transactions? (2/3m)
27. What is the advantage of using interrupt priority levels? (2/3m)
28. What is inode? Give its structure in UNIX. (2/3/4m)
29. Discuss the different techniques with which a file can be shared among different users. (or) Write short notes on file sharing. (2/3/4m)
30. Write short notes on UNIX file system. (2/3/4m)

UNIT-4

1. Write about Access matrix. (or) What is an access matrix and explain how it is implemented (or) Discuss the strength and weakness of implementing an access matrix using access lists that are associated with objects / domains. (5/10m) (V V V IMP)
2. Explain different program threats. (or) Differentiate program threats and system network threats. (5m/10m) (V IMP)
3. Difference between Access Matrix and Capability List. (2/3/4m) (IMP)
4. What are the goals and principles of Protection? (2/3/4/5m) (IMP)
5. Differentiate between protection and security. Explain the techniques used for protection of user files. (5m) (IMP)
6. Describe why authentication is important for the file protection. (or) What is the need for User authentication? (or) How is user authentication ensured in a real time system? (or) Write about the approaches used to provide User authentication. (3/4/5m) (V IMP)
7. Write short notes on firewall. (or) Explain how firewall can be used to protect systems and networks (3/4/5m) (IMP)
8. Explain the various security measures to protect files from unauthorized access. (5m) (IMP)
9. What is domain of protection? (2/3/4m) (IMP)
10. What is encryption? (or) What are two advantages of encrypting data stored in the computer system? (2m)
11. Give the advantage of lock-key mechanism. (2m)
12. How does the principle of least privilege aid in the creation of protection system (2m)
13. A password may become known to other users in a variety of ways. Is there a simple method for detecting that such an event has occurred? Explain your answer. (5m)
14. Explain about various types of Viruses (5m)
15. Explain Cryptography as a Security Tool (5m)
16. Differentiate between Symmetric and Asymmetric Encryption. (or) Compare symmetric and asymmetric encryption schemes, and discuss the circumstances under which a distributed system would use one or the other. (5m)
17. Explain about Symmetric Encryption with an Example (5m/10m)
18. Explain about Asymmetric Encryption with an Example (5m/10m)
19. Write short notes on i) Key Distribution ii) MAC iii) VPN iv) Defense in depth v) DMZ (4m)
20. What commonly used computer programs are prone to man-in-the middle attacks? Discuss solutions for preventing this form of attack. (4/5m)

UNIT-5

1. Explain the design principles and kernel modules in Linux operating system.(or) Discuss about Kernel modules in Linux. (or) Discuss about the main components of Linux system (5/10m) (V V V IMP)
2. Explain process scheduling in Linux. (or) Discuss scheduling in Linux. (or) Explain the implementation of scheduling in Linux. (or) Explain how process management in done in Linux.(5m) (V V IMP)
3. Explain the design principles of windows-7 operating system. (5m) (V V V IMP)
4. Explain the system components of windows-7 OS. (or) Explain the Architecture of Windows 7. (5/10m) (V V V IMP)
5. What is hardware abstraction layer? (or) What is the importance of hardware abstraction layer in windows-7. (2/3/4m)(V V IMP)
6. Explain file management in Linux. (2/3/4/5m)
7. Explain the file management in Windows 7. (2/3/4/5m)
8. What is the use of plug-and-play manager in WINDOWS-7 (2/3/4m)
9. How security issues are addressed in Linux? (2/3/4m)
10. Compare how process management is done in Linux and Windows-7. (2/3/4m)`
11. List the design goals of LINUX. (2/3m)
12. Mention features of Real time Kernels (2/3m)

**Practice the problems given below**

First prepare all the (V Imp/IMP) questions. Good students should learn all these questions. All the Best for your Exams

1) Discuss CPU scheduling algorithms with the following example and find avg. waiting time and avg. turn aroused time in a) FCFS b) SJF c) RR (Time slice = 2 ms).

Process Burst time Arrival time

P1 10 0

P2 2 0

P3 4 1

P4 5 2

P5 3 1

2) Calculate the average waiting time and turnaround time for the following example in

(a) FCFS (b) Preemptive SJF (c) Round Robin (d) Priority Time slice = 5 msec

Process Burst time Arrival time Priority

P1 15 0 4

P2 10 1 2

P3 25 2 1

P4 5 3 3

3) Discuss CPU scheduling algorithms with the following example and find the average waiting and turnaround time in each (time slice – 2ms).

P Burst time Priority Arrival time

P1 10 3 0

P2 1 2 1

P3 2 3 3

P4 1 4 1

P5 5 2 1

4) Consider the following set of processes.

Process Burst time Priority Arrival time

P1 10 3 0

P2 3 2 2

P3 1 1 1

P4 5 4 1

P5 7 2 1

(i) Draw the Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non-preemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2).

(ii) Calculate the turnaround time and waiting time of each of the process for each of the algorithm.

5) Consider the following set of processes. The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

Process Burst time Priority

P0 2 2

P1 1 1

P2 8 4

P3 4 2

P4 5 3

(i)Draw the Gantt charts that illustrate the following scheduling algorithms: FCFS, SJF, RR (TQ = 2) non preemptive priority ( large number = high priority).

(ii) Calculate the turnaround time and waiting time of each of the process for each of the algorithm.

6) int main()

{ int i, n;

for (i=1 ; i < = n; ++i)

fork();}

How many child processes are created?

7) Explain the Bankers algorithm for deadlock avoidance for the following example and

find the safe sequence after the request by P1 for (ABC) = (1 0 2).

Max Allocation Available

A B C A B C A B C

P0 7 5 3 0 1 0 3 3 2

P1 3 2 2 2 0 0

P2 9 0 2 3 0 2

P3 2 2 2 2 1 1

P4 4 3 3 0 0 2

8) Consider the following snapshot of a system:

Allocation Max Available

ABCD ABCD ABCD

P0 2 0 0 1 4 2 1 2 3 3 2 1

P1 3 1 2 1 5 2 5 2

P2 2 1 0 3 2 3 1 6

P3 1 3 1 2 1 4 2 4

P4 1 4 3 2 3 6 6 5

Illustrate that the system is in a safe state by demonstrating an order in which the processes may complete.

9) Consider the following snapshot of a system.

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

Answer the following questions using the banker’s algorithm.

1) What is the content of matrix need?

2) Is the system in a safe state

3) If a request from a process P1 arrives for (0, 4, 2, 0) can the request be granted immediately.

10) An operating system contains 3 resource classes. The number of resource units in these classes is 7, 7 and 10. The current resource allocation state is shown below:

Processes Allocated resources Maximum requirements

R1 R2 R3 R1 R2 R3

P1 2 2 3 3 6 8

P2 2 0 3 4 3 3

P3 1 2 4 3 4 4

a) What is the content of matrix need?

b) Is the current allocation state safe? Explain.

c) Can the request made by process P1 (1, 1, 0) be granted?

11) Given memory partitions of 100k, 500k, 200k, 300k, and 600k (in order), apply first fit and best fit algorithms to place processes with the space requirement of 212k, 417k, 112k, and 426k (in order)? Which algorithm makes the most effective use of memory?

12) Consider the following page-reference string 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. Calculate the number of page faults that would occur for the following algorithms assuming frame size as 4.

1. FIFO 2. Optimal 3. LRU 4. MRU 5. LFU 6. MFU

13) Find the number of page faults for the following reference string using (i) FIFO (ii) LRU (iii) Optimal page Replacement algorithm 1, 5, 1, 2, 5, 4, 2, 8, 7, 3, 4, 2, 1, 0 number of frames = 4.

14) Consider the following page-reference string 7,0,2,1,3,4,2,1,0,2,1,4,3,2,1,0,0,1,2,1. Calculate the number of page faults that would occur for the following algorithms assuming frame size as 3.

(i) FIFO (ii) Optimal (iii) LRU (iv) MRU (v) LFU (vi) MFU

15) Find the number of page facults in FIFO, LRU, OPTIMAL and LFU page replacement algorithms for the following reference string. 7 0 2 1 3 4 2 1 0 2 1 4 3 2 1 0 0 1 2 1 (no. of frames = 3).

16) Find the number of page faults in FIFO, LRU, OPTIMAL and LFU Page Replacement algorithms for the following reference string.7, 0, 2, 1, 3, 4, 2, 1, 0, 2, 1, 4, 3, 2, 1, 0, 0, 1, 2, 1 (no. of frames =4)

17) Discuss the following page replacement algorithms i) FIFO ii) LRU iii) Optimal iv) LFU

No. of frames = 3, 4 Reference string = 7, 0, 2, 0, 1, 2, 3, 4, 2, 1, 0, 2, 4, 3, 1, 0, 0, 2, 1

18) Consider the following page reference and reference time strings for a program: Page reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5 ………. Show how pages will be allocated using the FIFO page replacement policy. Also calculate the total number of page faults when allocated page blocks are 3 and 4 respectively.

19) Draw The Resource allocation graph for the following example.

P1 - > R1 P1 - > R2 P2 - >R3 R2 - > P2 R3 - > P3 R1 - > P1

20) Explain Disk scheduling algorithm’s for the following example and calculate seek time in

(a) FCFS (b) SSTF (c) SCAN (d) Look

Current location of read / write head is at 45 and previously it served a request at 29th cylinder. The I/O requests are 120, 85, 284, 46, 79, 124, 64, 96, 314 total no. of cylinders = 350.

21) Explain Disk scheduling algorithms for the following example. Initially the read/ write head is at 125 cylinder and total number of cylinders are 5000 i.e. 0 to 4999

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

22) Explain the Disk Scheduling algorithm for the given example below in case of :

(a) FCFS (b) SSTF (c) SCAN (d) C-SCAN (e) LOOK (f) C-LOOK

Total no. of Cylinders are 200, initially the read / write head is at 53 and previously visited 37 cylinder. Find the seek time for the set I/O request given below: 98, 129, 57, 122, 14, 12, 25, 47

23) Consider the situation in which the disk read/write head is currently located at track 45 (of tracks 0-255) and moving in the positive direction. Assume that the following track requests have been made in this order: 40, 67, 11, 240, and 87. What is the order in which optimized C-SCAN would service these requests and what is the total seek distance?