W'08 : 5 FN : CP 413/423/433 (1455)

OPERATING SYSTEMS

Time : Three hours

•   *Maximum Marks : 100*

*Answer FIVE questions, taking ANY TWO from **Group A**, ANY TWO from **Group B** and ALL from **Group C**.*

All parts of a question (a, b, etc.) should be answered at one place.

Answer should be brief and to-the-point and be supplemented with neat sketches. Unnecessary long answer may result in loss of marks.

Any missing or wrong data may be assumed suitably giving proper justification.

Figures on the right-hand side margin indicate full marks.

Group A

1. (*a*) What is a process ? How is it different from a program and a task ? Explain various stages of process life-cycle.   10

   (*b*) In your opinion, what should be difference in features of a single and multi-user operating systems ? Explain in detail.   10

2. (*a*) What are the essential conditions of occurrence of deadlock ? Explain each one of them with a method to handle the deadlock.   10

   (*b*) What is virtual memory ? Find hit ratio for following sequence of page requests, using first-in-first-out (FIFO) and OPT (optimal) method of page replacement: 10

   1, 2, 4, 2, 1, 3, 2, 5, 6, 7, 2, 4, 2, 3, 5, 6

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3. (a) What is fragment? Explain the difference between internal and external fragments. Explain how best fit allocation scheme minimizes the fragment size.   10

(b) What is file allocation table (FAT)? What is its role in file management? Explain the information stored in FAT.   10

4. (a) What are the parameters to analyze a given scheduling technique? Compare FCFS (First Come First Serve) and SRTN (Shortest Remaining Time Next) for following data set: 10

S.No.	Process Id	Arrival Time	Required CPU Time
1	P_1	9:00	3
2	P_2	9:02	2
3	P_3	9:03	1
4	P_4	9:05	4
5	P_5	9:06	3

(b) Write different steps for memory management. What is the difference between paging and segmented memory management? Explain the components of Page Map Table (PMT) and Segment Map Table (SMT).   10

Group B

5. (a) Define critical region. Explain the need for mutual exclusion in two concurrent processes. Write *any one* algorithm to implement mutual exclusion, and mention its limitations.   10

(b) Write file structure of Unix operating system. Explain which kind of memory management and process scheduling scheme is adopted in Unix system.   10

6. (a) When we connect a new device, like printer or web camera, why is a particular software required to be installed according to operating system? Show the place of device driver in the layered diagram of hardware and components of system software and application software. Also, explain its role.   10

(b) What is binary semaphore? Write different operations over semaphore. Explain how these operations are implemented using machine primitives.   10

7. (a) Explain various methods of security provided in Unix operating system to protect data/file of one user from another user of the system.   10

(b) The code of operating system resides in the main memory and the users also get access in main memory to execute their programs. Explain how operating system is protected from users and how program of user 1 is secured from program of user 2 during run time.   10

8. (a) What is distributed system? Explain how it provides fault tolerance, load sharing, and location transparency in the system.   10

(b) Explain shared memory and message queue concept for interposes communication.   10

Group C

9. Define the following in brief: 2×10

(*i*) Operating system

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(*ii*) Safe and unsafe sequences in deadlock

(*iii*) Multiprogramming

(*iv*) Resources of a computing system

(*v*) Monitor

(*vi*) Thread

(*vii*) Mention the type of applications for which round robin time sharing policy is appropriate.

(*viii*) LRU technique in page replacement algorithm

(*ix*) Resources graph

(*x*) Thrashing.

S'09 : 5 FN : CP 413/423/433 (1455)

OPERATING SYSTEM

Time : Three hours

Maximum Marks : 100

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Group A

1. (a) What is CPU state ? Explain how the notion of CPU state is useful in implementing multiprogramming. 10

   (b) The kernel of an OS masks off all interrupts during interrupt processing. Discuss its advantages and disadvantages. 10

2. (a) Two persons using the same time sharing system at the same time notice that the response time to their programs differ widely. What are the possible reasons for this difference ? 6

   (b) A job contains five data cards in a job step. However, the job step program tries to read 10 cards. Clearly explain actions of the command processor when the program tries to read the sixth and subsequent cards. 6

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(c) An OS cannot meet the response requirement of a real time application if it is executed as a single process. Explain, with an example, how creation of multiple processes can help to meet the response requirements of the application in the same OS.   8

3. (a) Describe how the number of scheduling actions performed in an OS depends on occurrence of events in the system. Develop a formula to calculate the number of times an OS performs scheduling.   10

(b) Describe conditions under which a kernel may perform dispatching without performing scheduling.   10

4. (a) Give examples of conflicts between user-centric and system-centric views of scheduling.   8

(b) Explain how starvation is avoided in the Unix and Window systems.   6

(c) Comment on validity of the following statement: 'The Unix scheduling policy favours interactive processes over non-interactive processes.'   6

Group B

5. (a) Two versions of a program P, called P_s and P_d, are developed using static and dynamic memory allocation, respectively. When an effort is made to execute P_s, an OS gives the message 'insufficient memory, cannot run the program'. However, the same OS executes program P_d without any difficulties. Explain why this happens.   12

(b) Discuss memory fragmentation in the buddy system and powers-of-two allocators.   8

6. (a) The kernel of an OS receives requests for memory allocation at a high rate. It is found that a large fraction of requests are for memory areas of size 100 bytes, 300 bytes and 400 bytes (called as standard sizes). Other requests are for areas of various other sizes. Design a memory allocation scheme in which no fragmentation arises while allocating areas of standard sizes and no internal fragmentation arises while allocating areas of other sizes.   12

(b) Comment on the following statements :

(i) Self-relocating programs are less efficient than relocatable programs.   4

(ii) There would be no need for linkers if all programs are coded as self relocating programs.   4

7. (a) The degree of multiprogramming in a paged virtual memory system is varied by changing the memory allocation for processes. Draw a graph of degree of multiprogramming vs. CPU efficiency. Explain the nature of the graph in the region of high degree of multiprogramming.   10

(b) An OS uses a simple strategy to deal with deadlock situations. When it finds that a set of processes is deadlocked, it aborts all of them and restarts them immediately. What are the conditions under which the deadlock will not recur ?   10

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8. Consider the following system :

	R_1	R_2	R_3
P_1	3	6	8
P_2	4	3	3
P_3	3	4	4

Max. Need

	R_1	R_2	R_3
P_1	2	2	3
P_2	2	0	3
P_3	1	2	4

Allocated Resources

	R_1	R_2	R_3
Total Alloc	5	4	10

	R_1	R_2	R_3
Total Exist	7	7	10

(a) Is the current allocation state safe ? Why ?   8

(b) Would the following requests be granted in the current state ?   3 × 4

     (i) Process P_1 requests $(1, 1, 0)$

     (ii) Process P_3 requests $(0, 1, 0)$

     (iii) Process P_2 requests $(0, 1, 0)$

Group C

9. Write *true/false* for the following and justify your answer :   10 × 2

     (i) Multitasking means the computer appears to be running more than one program at a time.

     (ii) Storage overcommitment means your computer has too many programs on its hard disk.

(iii) A peripheral device tears easily on the dotted line.

(iv) Memory is measured in kilobytes.

(v) Microprocessors must be either an 80286 or an 80386 or an 80486 to run OS/2.

(vi) S/W is a term to describe programming languages.

(vii) RAM is erased every time the computer is turned on.

(viii) The Task Manager in the Window lists all programs that are running.

(ix) How do you stop a batch file and return to the command prompt before the batch file finishes by pressing ctrl + Alt + del.

(x) When can the command prompt be changed during initialization in a batch file.

W'09 : 5 FN : CP 413/423/433 (1455)

OPERATING SYSTEMS

Time : Three hours

Maximum marks : 100

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All parts of a question (a, b, etc.) should be answered at one place.

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Group A

1. (a) What are the different functions of an operating systems (OS) ? Explain different classes of OS along with their advantages and disadvantages.   10

    (b) Out of multiprogramming and time sharing OS, which one is having maximum system utilization and which one is having maximum user response and why ? Can you categorize batch processing as one kind of multiprogramming ?   10

2. (a) Is it possible to enjoy more than cent percent utilization of the main memory ? If so, how ? What type(s) of OS adopt(s) the technique ?   10

(Turn Over)

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(b) Is there any difference between backup memory and virtual memory? What are the memory managements where (i) internal fragmentation, and (ii) external fragmentation occurs and why?   10

3. (a) What are the similarities and differences between a segment and a page? Which one is transparent and which one is translucent to the user and why?   10

(b) Find out the difference(s) between segmented memory management and demand paged memory management scheme. In what respect segmented and demand paged memory management is better than ordinary demand paged memory management?   10

4. (a) What are different tasks to be performed by file management system? Draw the hierarchical model of a file system and explain different modules.   10

(b) How logical file system (LFS) differs from physical file system (PFS)? Explain with suitable examples.   10

Group B

5. (a) Why and for what type(s) of OS mutual exclusion is needed? How semaphore, critical region and event queue differs from one another?   10

(b) What are the conditions for occurrences of deadlock? What are the different techniques to avoid deadlock?   10

6. (a) What is a distributed OS? What are the advantages and disadvantages of it? How would you model a distributed OS? Can it ever be a tree?   10

(b) What are the different non-pre-emptive scheduling techniques known to you? Can you tell Round Robin scheduling as one type of non-pre-emptive scheduling? What is the difference between Round Robin scheduling and Limited Round Robin scheduling?   10

7. (a) What is the difference between job scheduling and process scheduling? What are different components of job scheduling and process scheduling? Explain with reference to a standard multiuser time sharing OS.   10

(b) What do you mean by a job class? Who has to define it? What should be job classes in a pure time sharing OS like UNIX?   10

8. (a) What should be the process state transition diagram for UNIX OS? What is the physical location of a process when it is in 'swapped out' state?   10

(b) Out of CPU bound and IO bound processes, which one is having more priority and why? Is it possible to make a state transition from 'blocked' state to 'running' state? Explain.   10

Group C

9. Write short notes on the following: 5 × 4

(i) Multitasking

(ii) Mutual exclusion

(iii) Swapping

(iv) Kernel level thread

(v) Segmented and demand paged memory management.

S'10 : 5 FN : CP 413/423/433 (1455)

OPERATING SYSTEMS

Time : Three hours

Maximum marks : 100

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ANY TWO *from* **Group B** *and* ALL *from* **Group C.**

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mented with neat sketches. Unnecessary long answers
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Figures on the right-hand side margin indicate full marks.

Group A

1. (*a*) What is CPU state ? Explain how the notion of CPU
state is useful in implementing multiprogramming.   10

   (*b*) The kernel of OS masks off all interrupts during
interrupt processing. Discuss its advantages and dis-
advantages.   10

2. (*a*) Two persons using the same time-sharing system at
the same time notice that the response times to their
programs differ widely ? What are the possible rea-
sons for this difference ?   10

   (*b*) A real time application requires a response time of
2 sec. Discuss the feasibility of using a time-sharing
system for the real time application, if the average
response time in the time-sharing system is (*i*) 20
sec, (*ii*) 2 sec, (*iii*) 0.2 sec.   10

3. (*a*) Explain how starvation is avoided in Unix and Windows systems ?   8

(*b*) What do you mean by scheduling in batch processing ?   6

(*c*) Give examples of conflicts between user-centric and system-centric views of scheduling.   6

4. (*a*) Discuss memory fragmentation in the buddy system and powers-of-two allocators.   6

(*b*) A memory allocator works as follows : Small memory areas are allocated using a buddy system. Large memory areas are allocated using a free list and a first fit allocator. Comment on the efficiency and memory utilization achieved by this allocator.   8

(*c*) Discuss how the stable storage technique can be used to prevent loss of file system integrity.   6

Group B

5. Compare and contrast the following policies of resource allocation :

(*a*) All resource requests together   6

(*b*) Allocation using resource ranking   8

(*c*) Allocation using Banker's algorithm   6

on the basis of (*i*) resource idling, and (*ii*) overhead of the resource allocation algorithm.

6. (*a*) List the security attacks that cannot be prevented by encryption.   6

(*b*) Describe why authentication is important for file protection.   6

(*c*) Describe the provisions in Unix for (*i*) finding the id of the user who owns a file, (*i*) deciding whether a user belongs to the same user group as the owner of a file.   13

7. (*a*) Explore the possibility of implementing the blocking and non-blocking protocols using monitors. What are the difficulties in the implementation ?   10

(*b*) Two concurrent processes share a data item sum, which is initialised to 0; however, they do not use mutual exclusion while accessing its value. Each process contains a loop that executes the single statement sum: = sum + 1 50 times. If no other operations are performed on sum, indicate the lower bound and upper bound on the value of sum when both processes terminate.   10

8. (*a*) Comment on implications of the following features for efficient use and user convenience : (*i*) Sequence of programs, (*ii*) virtual devices.   6

(*b*) Justify the following statement : 'Due to presence of the cache memory, a program requires more CPU time to execute in a multiprogramming or time-sharing system than it would require if it were to be executed all by itself, i.e., without having any other programs in the system'.   8

(*c*) Draw a time chart for a system containing two CPU-bound programs and two I/O bound programs when (*i*) CPU-bound programs have a higher priority, and (*ii*) I/O-bound programs have a higher priority.   6

Group C

1. Write *true/false* for the following statements: 10 × 2

(*i*) Multitasking means the computer appears to be running more than one program at a time.

(*ii*) Storage overcommitment means OS/2 can run more programs than there is space in memory because some of the data is also stored on the hard disk.

(*iii*) Microprocessors are the brain of the computer.

(*iv*) A computer uses its memory as a place to store data and programs.

(*v*) ROM stands for reliable old memory.

(*vi*) RAM is erased every time the computer is turned on.

(*vii*) The function of the Task Manager is the Window that lists all programs that are running.

(*viii*) The path name is the place where you type commands.

(*ix*) When an application is minimised, it is reduced to an icon in the lower left of the screen.

(*x*) A bootable diskette is a diskette that can be used to initialize the computer for use.

W'10 : 5 FN : CP 413/423/433 (1455)

OPERATING SYSTEMS

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mented with neat sketches. Unnecessary long answers
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Group A

1. (*a*) Differentiate between job, process, and task with
   a suitable example.   8

   (*b*) What are different goals of an operating system ?
   What are different views of operating system ?   12

2. (*a*) How a time-sharing system differs from (*i*) batch
   processing system, (*ii*) multiprogramming system,
   and (*iii*) real time system ?   12

   (*b*) Explain one command interpreting with reference
   to MS-DOS.   8

3. (*a*) What are the purposes served by any information
   management system ? Discuss them in detail.   10

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(*b*) Draw the hierarchical model of a file system and explain the various modules. What is a physical block number? **10**

4. (*a*) What is the difference between paged memory management and demand paged memory management? How is more than 100% utilization of main memory possible in case of demand paged memory management? **12**

(*b*) What is the difference between internal and external fragmentation? Explain with examples. **8**

Group B

5. (*a*) What do you understand by mutual excursion? What are the different techniques of mutual excursion? **10**

(*b*) Explain, with suitable examples, how critical region differs from conditional critical region. What has to be applied when? **10**

6. (*a*) What do you mean by 'process state transition diagram'? For what type(s) of operating system it is valid and why? **8**

(*b*) How a 'blocked state' differs from 'swapped out state'? What is the physical location of a process when it is in steady state, running state, blocked state, and swapped out state. **12**

7. (*a*) How UNIX differs from ordinary time-sharing system? What should be the job classes in UNIX? **8**

(*b*) What is the basic difference between distributed operating system and network? How would you model a distributed operating system? What are the advantages of distributed operating system? **12**

8. (*a*) What are different types of pre-emptitive scheduling known to you? How Round Robin scheduling differs from Limited Round Robin scheduling? **10**

(*b*) What is a real time operating system? What are its applications? Explain them in brief. **10**

Group C

9. Answer the following in brief: **5 × 4**

(*i*) Multiprogramming

(*ii*) Thrashing

(*iii*) User level thread

(*iv*) Segmented memory management

(*v*) Virtual and backup memory.

W'12: 5 FN: CP 413/423/433 (1455)

OPERATING SYSTEM

Time : Three hours

Maximum Marks : 100

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ANY TWO *from* **Group B** and ALL *from* **Group C.**

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answered at one place.*

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mented with neat sketches. Unnecessary long answer may
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Group A

1. (a) Draw the state diagram of a process from its
        creation to termination, including all transitions, and
        explain every state and every transition with an
        example.   10

    (b) Why is segmented paging important as compared
        to a paging system ? What are different pieces of the
        virtual address in a segmented paging ?   10

2. (a) 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, 87. What is the order
        in which optimized C-SCAN would service these
        requests and what is the total seek distance ?12

(b) What is a process scheduling ? Explain different sub-functions of process scheduling.   8

3. (a) What is a deadlock ? Explain the necessary conditions for deadlock to occur.   10

(b) What is an I/O buffer ? What is the advantage of buffering ? Is buffering always effective ? Justify your answer with the help of an example.   10

4. (a) Categorize the CPU scheduling algorithms. Explain non-pre-emptive algorithms.   10

(b) Explain the differences between the following :
    3 + 3 + 4

(i) Logical and physical address space

(ii) Internal and external fragmentation

(iii) Paging and segmentation.

Group B

5. (a) Differentiate between protection and security. Explain the techniques used for protection of user files.   10

(b) What is meant by inter-process communication ? Explain two fundamental models of inter-process communication.   10

6. (a) What are interacting processes ? Explain a method of implementing interacting processes.   10

(b) What are the differences between user level threads and kernel-supported threads ?   10

7. (a) Give a solution for readers-writers problem using conditional critical regions.   10

(b) Differentiate between synchronous and asynchronous input/output with the help of an example.   10

8. (a) List the major activities of an operating system with respect to memory management, secondary storage management and process management.   10

(b) What is the data structure used by an operating system to keep track of process information ? Explain.   10

Group C

9. Choose the *correct* answer for the following :   10 × 2

(i) The process related to process control, file management, device management, information about system and communication that is requested by any higher level language can be performed by ———.

(a) editors.

(b) compilers.

(c) system call.

(d) caching.

(ii) Multiprogramming systems ———.

(a) are easier to develop than single programming systems.

(b) execute each job faster.

(c) execute more jobs in the same time.

(d) are used only on large mainframe computers.

(*iii*) Which one is not the state of the process ?

   (*a*) Blocked

   (*b*) Running

   (*c*) Ready

   (*d*) Privileged

(*iv*) The problem of thrashing is effected scientifically by ———.

   (*a*) program structure.

   (*b*) program size.

   (*c*) primary storage size.

   (*d*) None of the three above.

(*v*) The state of a process after it encounters an I/O instruction is ———.

   (*a*) ready.

   (*b*) blocked/waiting.

   (*c*) idle.

   (*d*) running.

(*vi*) The number of processes completed per unit time is known as ———.

   (*a*) output.

   (*b*) throughput.

   (*c*) efficiency.

   (*d*) capacity.

(*vii*) ——— is the situation in which a process is waiting on another process, which is also waiting on another process, which is waiting on the first process. None of the processes involved in this circular wait are making progress.

   (*a*) Deadlock

   (*b*) Starvation

   (*c*) Dormant

   (*d*) None of the three above.

(*viii*) Which one of the following file name extension suggests that the file is backup copy of another file ?

   (*a*) TXT

   (*b*) COM

   (*c*) BAS

   (*d*) BAK

(*ix*) Which was the technique introduced because a single job could not keep both the CPU and the I/O devices busy ?

   (*a*) Time-sharing

   (*b*) Spooling

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    (*c*) Pre-emptive scheduling

    (*d*) Multiprogramming.

(*x*) A critical region is

    (*a*) a piece of code which only one process executes at a time.

    (*b*) a region prone to deadlock.

    (*c*) a piece of code which only a finite number of processes execute.

    (*d*) found only in Windows NT operating system.

S'13 : 5 FN : CP 413/423/433 (1455)

OPERATING SYSTEM

Time : Three hours

Maximum Marks : 100

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Group A

1. (a) Distinguish between paging and segmentation.   7

     (b) What is file concept ? What are various operations that can be performed on a file ?   8

     (c) What is command interpreter ? Explain its working and functions.   5

2. (a) What is deadlock avoidance ? What is safe state ? Write an algorithm for deadlock avoidance.   1 + 3 + 4

     (b) What are the advantages of paging ? What is the difference between paging and frames ? What is the need for page replacement ? Explain the concept of thrashing taking an illustrative example.   4 + 2 + 2 + 4

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3. (*a*) Distinguish between multiprogramming and time-sharing.   5

(*b*) Explain the working of disk-based I/O system.   5

(*c*) Discuss advantages of segmentation.   5

(*d*) Explain conditions for occurrence of a deadlock.   5

4. (*a*) An operating system uses a simple strategy to deal with deadlock situations. When it finds that a set of processes is deadlocked, it alerts all of them and restart them immediately. What are the conditions under which the deadlock will not occur ?   10

(*b*) 'A memory mapped file provides advantages of both sequential and direct files.' Comment on validity of this statement.   10

Group B

5. (*a*) An airline reservation system is to be implemented using monitors. The system must process booking and cancellation requests and perform appropriate action.

    (*i*) Identify the shared data and operation processes required.   5

    (*ii*) Implement the reservation system using monitors.   5

(*b*) Write a note on synchronization of processors that execute code of an SMP kernel in parallel. Also, discuss suitability of various kinds of locks to satisfy these synchronization requirements.   10

6. (*a*) Discuss whether encryption can ensure secrecy, privacy and integrity of data.   10

(*b*) Mention advantages and drawbacks of performing file protection checks at (*i*) file open time, and (*ii*) every read or write operation.   10

7. Explain the following concepts :   4 × 5

(*a*) Piping

(*b*) Device independent I/O

(*c*) Protection

(*d*) Process synchronization

8. (*a*) Discuss various threats to security in any computing environment.   10

(*b*) What are the advantages of distributed systems over the centralised system ?   10

Group C

9. Answer the following in brief :   10 × 2

(*i*) How is a file with two names different from having two copies of a file ?

(*ii*) On a system with 2^{24} bytes of memory and fixed partitions of size 6.5, 536 bytes, how many bits the limit register must have ?

(*iii*) What do you understand by swapping memory ?

(*iv*) How many processes may share a messaging object ?

(*v*) Show the relationship between safe, unsafe and deadlock states with the help of a diagram.

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W'13 : 5 FN : CP 413/423/433 (1455)

OPERATING SYSTEMS

Time : Three hours

Maximum Marks : 100

Answer FIVE *questions, taking* ANY TWO *from* **Group A,**
ANY TWO *from* **Group B** and ALL *from* **Group C.**

*All parts of a question (a, b, etc.) should be
answered at one place.*

*Answer should be brief and to-the-point and be supplemented
with neat sketches. Unnecessary long answer may result in
loss of marks.*

*Any missing or wrong data may be assumed suitably
giving proper justification.*

Figures on the right-hand side margin indicate full marks.

Group A

1. (a) What is the purpose of command interpreter ? Why is it usually separate from the kernel ? Would it be possible for user to develop a new command interpreter using the system call interference provided by OS ?   2 + 2 + 2

    (b) Explain deadlock detection and deadlock recovery. How are they implemented ?   7

    (c) Explain allocation methods in directory implementations. Also, define seek time and rotational latency in disk structures.   5 + 1 + 1

2. (a) Define essential properties of following types of operating system : (*i*) Batch, (*ii*) interactive, (*iii*) time sharing,

(iv) real time, (v) network.   5 × 1

(b) Find the TAT (turnaround time) and average waiting time using the priority scheduling in non-pre-emptive mode using Gantt chart :

Process No.	P1	P2	P3	P4	P5	P6
Priority	4	5	7	2	1	6
Arrival Time	0	1	2	3	4	5
Burst Time	4	5	1	2	3	6

Also, define burst time and response time.   6 + 1 + 1

(c) Compare the main memory organization schemes of contiguous-memory allocation, pure segmentation and pure paging with respect to the following issues :   7

   (i) External fragmentation

   (ii) Internal fragmentation

   (iii) Ability to share code across process.

3. (a) Perform optimal page replacement on following reference string :

   -7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1
   Find number of page faults and define optimal page replacement.   5

(b) What is thrashing ? Explain its causes and write *any two* solutions to increase CPU utilization in case of thrashing.   1 + 2 + 2

(c) A main memory unit with capacity of 4 Mb is built using 1M* 1bit RAM chips. Each RAM chip is having 1K rows of cells with 1K cells in each row. Find the time required to perfrom one refresh operation on all the cells in memory cell.   5

(d) Write issues related to distributed file system.   5

4. (a) Define Banker algorithm ? Where is it used ? Also, define safe sequence.   2 + 2 + 1

(b) Define memory management and explain its different policies.   2 + 5

(c) What do you mean by address binding and its type ?   1 + 4

(d) Consider a system having n process and 6 tape drivers, each process requires two tape drivers to complete their execution. What is maximum values of n which ensures the deadlock free operation ?   3

Group B

5. (a) Define conditions to be followed to achieve synchronization and also solution to achieve synchronization with their types.   10

(b) What are various kinds of performance overheads associated with servicing an interrupt ?   5

(c) Define critical section problem with an example and also discuss solution to it.   5

6. (a) Explain multiuser working of an operating system with an example. Also, explain its design issues.   10

(b) Define properties mutual exclusion and progress. Consider the methods used by the process P1 and P2 for accessing its critical section whenever needed as given below. The initial values of shared Boolean variables s1 and s2 are randomly assigned.

Methods used by P1	Methods used by P2
While (s1 = s2)	While (s1 = s2)
Critical section	Critical section
s1 = s2 ;	s2 = not (s1) ;

Explain the properties achieved by these methods- mutual exclusion or progress or both.   2 + 8

7. (a) Define user authentication and how it is achieved. Also, explain auditing, accounting, logging in terms of security.   1 + 4 + 3

(b) Define semaphores and its types. Define monitor and explain how they differ from semaphores. Also, explain in terms of implementation.   2 + 2 + 5

(c) Define critical section with an example and outline its solution.   3

8. Write short notes on the following :   4 × 5

(a) Device drivers and controller

(b) Interprocess communication

(c) Distributed systems

(d) DMA

Group C

9. Answer the following in brief :   10 × 2

(i) What is disk interleaving ?

(ii) Define threads and their types.

(iii) Define *four* characteristics of deadlock.

(iv) In which case round robin scheduling acts as first come first serve scheduling ?

(v) Define concurrent programming.

(vi) What do you mean by invert paging ?

(vii) What do you mean by semaphore ?

(viii) Define the term 'spooling'.

(ix) What is virtual memory ?

(x) Explain time sharing operating system.

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