

**OPERATING SYSTEMS
(CSE2102)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

- (i) To access the services of operating system the interface is provided by the
(a) System call (b) Application Program
(c) API (d) Assembly Instructions
- (ii) Which of the following operating systems does not support more than one program at a time?
(a) Windows (b) Linux (c) Unix (d) DOS.
- (iii) Which of the following is not a condition that causes deadlock?
(a) Mutual Exclusion (b) Pre-emption
(c) Hold and wait (d) Circular wait.
- (iv) Which among the following can't create a new process?
(a) fork (b) excelp (c) execve (d) execp
- (v) If fork is called n times successfully how many child processes executed simultaneously?
(a) n (b) $2^n - 1$ (c) 2^n (d) n-1
- (vi) If a page number is not found in the translation lookaside buffer, then it is known as a?
(a) Translation look aside buffer miss (b) Translation look aside buffer hit
(c) Page hit (d) Page miss.
- (vii) Which address is generated by the CPU?
(a) Physical address (b) Logical address
(c) Virtual address (d) Real address.
- (viii) Thrashing occurs when
(a) the system is overloaded with processes
(b) there are insufficient page frames in memory
(c) the CPU spends more time swapping pages than executing processes
(d) all of the above.

- (ix) DMA stands for
 (a) Digital Memory Access (b) Dual Memory Access
 (c) Direct Memory Access (d) Duplex Memory Access
- (x) ACL stands for
 (a) Absolute Control List (b) Access Control List
 (c) Abrupt Control List (d) None of the above

Fill in the blanks with the correct word

- (xi) The base and limit registers are updated for every process in _____ mode.
- (xii) An edge from process to resource is known as _____.
- (xiii) If time quantum is too short RR scheduling suffers from _____.
- (xiv) In a segmentation system, a program is divided into segments of _____ length, such as functions or data arrays.
- (xv) The time required to move the disk arm to the required track is known as _____.

Group - B

2. (a) Distinguish between multi programming and multitasking operating system. [[CO1](Compare/LOCQ)]
- (b) Write the purpose of using system call. Mention the different types of system calls. [[CO1](Remember/LOCQ)]
- (c) When a system call is made then describe how the mode bit of the system changes with the help of a suitable diagram. [[CO1](Remember/LOCQ)]
- 4 + 4 + 4 = 12**
3. (a) Write short notes on User Level Thread and Kernel Level thread. [[CO1](Remember/LOCQ)]
- (b) How is Parallelism achieved using Threads? How much Speedup can be achieved for a 60% serial, 40% parallel process by shifting from single to four cores. [[CO1](Apply/IOCQ)]
- (c) Write names of functions to create a new process. [[CO1](Remember/LOCQ)]
- 4 + 6 + 2 = 12**

Group - C

4. (a) Briefly describe the Dining Philosophers problem as a synchronization problem and solve it with semaphore. [[CO3](Analyse/LOCQ)]
- (b) State whether a deadlock situation will occur in Dining Philosophers problem and if yes then how it can be solved using semaphore. [[CO3](Remember/HOCQ)]
- (c) Consider a non-negative counting semaphore S as 10. The operation P(S) decrements S, and V(S) increments S. During an execution, 20 P(S) operations and 12 V(S) operations are issued in some order. What will be the final value of S? [[CO2](Apply/IOCQ)]
- 5 + 5 + 2 = 12**

5. (a) Consider three processes, all arriving at time zero, with total execution time of 10, 20 and 30 units respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible. For what percentage of time does the CPU remain idle? [[CO2)(Analyse/HOCQ]]
- (b) Consider the table given below which contains information about different processes:

Process	Burst time (ms)	Priority
P ₁	8	4
P ₂	6	1
P ₃	1	2
P ₄	9	2
P ₅	3	3

Calculate average Turn Around Time and average Waiting time using Round Robin Scheduling algorithm for the above set of processes. Consider Time Quantum value= 1ms. [[CO2)(Remember/LOCQ]]

- (c) If the time quantum is set either too small or too large then what will happen and why? [[CO2)(Apply/IOCQ]]

$$4 + 5 + 3 = 12$$

Group - D

6. (a) Suppose our process is allocated three (0 - 2) page frames in *physical memory*. The process consists of nine (0 - 8) pages that are referenced. Below is the order in which pages are referenced in program execution:

Page Ref:	0	1	2	0	1	2	3	4	2	5	0	6	0	7	7	8	0	6
Frame 0:	0*	0	0															
Frame 1:		1*	1															
Frame 2:			2*															

Complete the table given above using FIFO page replacement algorithm. Report the total number of page faults. [Mark the page faults with an * (asterisk) in the table as shown] [[CO4)(Analyse/HOCQ]]

- (b) Find the size of the memory if its address consists of 22 bits. Assume the memory is 2-byte addressable. [[CO4)(Remember/LOCQ]]

- (c) Consider a single level paging scheme. The virtual address space is 256 MB and page table entry size is 4 bytes. What is the minimum page size possible such that the entire page table fits well in one page? [[CO4)(Apply/IOCQ]]

$$5 + 3 + 4 = 12$$

7. (a) Describe segmentation and its advantages over paging. [[CO4)(Analyse/HOCQ]]

- (b) Explain the difference between Internal and External fragmentation. Which one occurs in paging system? How can the problem of external fragmentation be solved? *[[CO4](Remember/LOCQ)]*
- (c) How would each of the first fit, best fit and worst fit algorithms place processes of 212KB, 417KB, 112KB and 426KB (in order). Which algorithm makes the most efficient use of memory? *[[CO4](Apply/IOCQ)]*
- 4 + 4 + 4 = 12**

Group - E

8. (a) Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The LOOK and C-LOOK scheduling algorithm is used. The head is initially at cylinder number 53 moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. What is the total head movement (in number of cylinders) incurred while servicing these requests? *[[CO5](Analyse/IOCQ)]*
- (b) Describe different file attributes from user point of view. *[[CO5](Remember/LOCQ)]*
- (c) What are the functions of file management system? *[[CO5](Remember/LOCQ)]*
- (3 + 3) + 3 + 3 = 12**
9. (a) Draw and explain the Programmed driven and Interrupt driven I/O for data transfer. *[[CO5](Analyse/IOCQ)]*
- (b) What are the different roles of the Kernel I/O subsystem? Define each of them. *[[CO5](Remember/LOCQ)]*
- (3 + 3) + 6 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	49	32	19