Nitish Kumar Gupta
Course: GATE
Computer Science Engineering(CS)

HOME
MY TEST
BOOKMARKS
MY PROFILE
REPORTS
BUY PACKAGE
ASK AN EXPERT
OFFER
EXCLUSIVE OFFER FOR OTS STUDENTS ONLY ON BOOK PACKAGES

SINGLE SUBJECT : OPERATING SYSTEM (GATE - 2019) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(33) | CORRECT(0) | INCORRECT(0) | SKIPPED(33)

Q. 1

Which of the following scheduling strategies is used by Long Term Scheduler?

Solution Video | Have any Doubt ?

A. First Come First Serve

B. Shortest Remaining Job First

C. Shortest Job First

D. None of the above — Correct Option

Solution :
(d)
All are used by short term scheduler to move the processes from ready state to running state but not by Long term scheduler.

QUESTION ANALYTICS +

Q. 2

Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

Which of the following logical addresses generate trap to operating system?
(i) 0, 430 (ii) 1, 10
(iii) 2, 500 (iv) 3, 400
(v) 4, 112

Solution Video | Have any Doubt ?

A. (ii) and (iii) only

B. (iii) and (iv) only

C. (i) and (v) only

D. (iii) and (v) only — Correct Option

Solution :
(d)
• Since 430 < 600, So , Physical address: 219 + 430 = 649
• Since 10 < 14 , So, Physical address: 2300 + 10 = 2310
• Since 500 >100, So, illegal reference and traps to operating system.
• Since 400 < 580 , So, Physical address: 1327 + 400 = 1727
• Since 112 > 96, So, illegal reference and traps to operating system

QUESTION ANALYTICS +

Q. 3

Consider the following statements:
S_1 : Multiprogramming is used to increase CPU utilization, while time-sharing is used to increase CPU responsiveness in interacting with user.
S_2 : If a user-level thread is blocked for I/O operation, then kernel of operating system will perform context switching to run another user-thread which is not blocked.
S_3 : Many-to-One is the most efficient model of multi-threading because it allows several userlevel threads to be assigned to different processors in a multi-processor computer system.
Which of the following is true?

Solution Video | Have any Doubt ?

A. Only S_1 and S_2 — Correct Option

Solution :
(a)
• Multiprogramming is used to increase CPU utilization, while time-sharing is used to increase CPU responsiveness in interacting with user.
• The Kernel does not have any information about the user-level threads, therefore, it cannot do task switching for user-level threads.
• Many-to-One uses one kernel thread therefore it cannot use multi-processor facility.

B. Only S_2 and S_3

C. Only S_1 and S_3

D. None of these

QUESTION ANALYTICS +

Q. 4

Consider the following statements:
S_1 : : If all jobs arrive at the same point in time, a SJF and an SRTF scheduler will behave the same.
S_2 : If all jobs arrive at the same point in time and have identical run lengths, a FIFO and a SJF scheduler will behave the same.
S_3 : If all jobs have identical run lengths, a RR scheduler provides better average turnaround time than FIFO.
S_4 : With a MLFQ scheduler, high priority jobs have longer time-slices than low priority jobs.
Which of the following is true?

Solution Video | Have any Doubt ?

A S_1 and S_3 only

B S_2 and S_3 only

C S_1 and S_2 only — Correct Option

Solution :
(c)
• Since all jobs arrive at the same point in time, a SJF and an SRTF scheduler run all process for same amount of time.
• All are of identical run lengths FIFO and a SJF scheduler will behave the same, Since no shortest job concept is come.
• If all jobs are identical, RR is horrible for turnaround time because all jobs will complete at nearly the same time.
• Since jobs that do a lot of computation (long CPU burst) are given low priority.

D S_3 and S_4 only

QUESTION ANALYTICS

Q. 5

A bit-map can be used to keep track of which blocks are free in a file-system's partition on disk.
Assuming, 1 KB block size and a disk size of 40 GB, what is the size of the bit map?

Solution Video | Have any Doubt ?

A 2.5 MB

B 4 MB

C 4.5 MB

D 5 MB — Correct Option

Solution :
(d)

$$\text{Disk size} = 40\ \text{GB}$$
$$\text{Block size} = 1\ \text{KB}$$
$$\text{Number of blocks} = \frac{40 \times 2^{30}}{8 \times 2^{10}}$$
$$= 5\ \text{MB}$$

QUESTION ANALYTICS

Q. 6

Consider the following statements:
S_1 : Long Term Scheduler sends the process from ready state to running state
S_2 : Medium Term Scheduler controls the degree of multiprogramming.
Which of the following is correct?

Solution Video | Have any Doubt ?

A Only S_1

B Only S_2

C Both S_1 and S_2

D Neither S_1 nor S_2 — Correct Option

Solution :
(d)
Long term scheduler controls degree of multiprogramming.
Short term scheduler sends the process from ready state to running state.

QUESTION ANALYTICS

Q. 7

Which of the following is true?

Solution Video | Have any Doubt ?

A With Kernel-level threads, multiple threads from the same process can be scheduled on multiple CPUs simultaneously. — Correct Option

Solution :
(a)
• The benefit of Kernel-level threads (true thread support from operating system); we could not do this with user-level threads. So, True.
• The OS scheduler can still perform context switches whenever it wants; there is no coordination between the scheduler and the lock implementation. Locks simply ensure that if the scheduler schedules a second thread that also wants to enter the same critical section as the first thread, then the second thread cannot acquire the lock until the first thread releases it. So, False.
• If you use a semaphore for mutual exclusion, it has all the same properties as a traditional lock, so deadlock can't be avoided always. So, False.
• A thread can hold/acquire any number of locks simultaneously. So, True.

B Locks prevent the operating system scheduler from performing a context switch during a critical section.

C Deadlock can always be avoided by using semaphores instead of locks for mutual exclusion.

D A thread can hold only one lock at a time.

QUESTION ANALYTICS +

Q. 8

Consider 900 KB memory is managed using variable partitions but no compaction. It currently has three process occupied partition of sizes 212 KB, 114 KB and 100 KB respectively. Which of the following is the smallest allocation request that could be denied?

Solution Video | Have any Doubt ?

A 475 KB

B 285 KB

C 355 KB

D None of the above — Correct Option

Solution :
(d)
Since allocation of memory to process can be in any place.

QUESTION ANALYTICS +

Q. 9

A CPU generates 64 bits virtual address. Page size is of 8 KB. The processor has a Translation Lookaside Buffer (TLB) which can hold a total of 256 page table entries and is 4-way set associative. What is the minimum size of TLB tag?

Solution Video | Have any Doubt ?

A 37 bits

B 40 bits

C 42 bits

D 45 bits — Correct Option

Solution :
(d)

$$\begin{aligned}\text{Page Size} &= 8\text{ K}\\ \text{Offset bits} &= 13\\ \text{Virtual Address} &= 64\text{ bits}\\ \text{Remaining bits} &= 64 - 13 = 51\text{ bits}\\ \text{Number of sets} &= \frac{256}{4} = 64 = 6\text{ bits}\\ \text{Tag bits} &= 51 - 6 = 45\text{ bits}\end{aligned}$$

QUESTION ANALYTICS +

Q. 10

Consider the following statements:
S_1 : Linked allocation of files on a disk space can lead to internal fragmentation.
S_2 : Under linked allocation of disk space, if a program has just read the tenth disk block, now if it want to read the sixth disk block, it will again start accessing from the first disk block.
S_3 : Indexed allocation can support both sequential and direct access to file.
Which of the above statements is/are correct?

Solution Video | Have any Doubt ?

A Only 1 and 2

B Only 2 and 3

C All of these — Correct Option

Solution :
(c)

- Internal fragmentation (if exists) is possible only in last disk block of file.
- Linked-allocation can be used effectively only for sequential access file. To find the i^{th} block of a file. We must start at the beginning of that file and follow the pointers until we get the i^{th} block.
- Statement is correct.

D None of these

QUESTION ANALYTICS +

Q. 11

Say we have the process arrival time and burst time chart given below:

Processes	Arrival Time	Burst Time
1	0	16
2	0	10

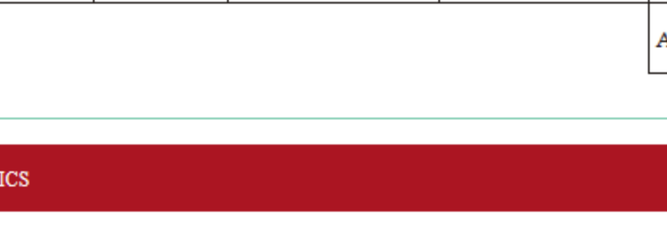
3	6	4
4	7	6
5	8	10

The average waiting time if round robin scheduling (Time quantum = 5 units) is used is _____.
(Upto 1 decimal place)

Solution Video | Have any Doubt ?

23.4 (23.3 - 23.5) — Correct Option

Solution :
23.4 (23.3 - 23.5)
Following is the Grantt chart:



Waiting queue: $P_1\ P_2\ P_1\ P_3\ P_4\ P_5\ P_2\ P_1\ P_4\ P_5\ P_1$

Turnaround time = Completion Time – Arrival Time

Waiting time = Turn Around Time – Burst Time

Updation of burst times:

Processes	Burst time updation sequence
1	$16 \to 11 \to 6 \to 1$
2	$10 \to 5 \to 0$
3	$4 \to 0$
4	$6 \to 1 \to 0$
5	$10 \to 5 \to 0$

Processes	Arrival Time	Burst Time	Completion Time	Turn Around Time	Waiting Time
1	0	16	46	46	30
2	0	10	34	34	24
3	6	4	19	13	9
4	7	6	40	33	27
5	8	10	45	37	27
					Average $= \frac{117}{5} = 23.4$

QUESTION ANALYTICS

Q. 12

Let P and V be semaphore operations. P represents wait and V represents signal operation. Counting semaphore variable S is initialized to 1 and no blocked processes are present in the system. If the following operations are performed in the given order then the value of S is _____.

P, V, P, V, V, P, P, V, V, V, P, V, V, V, P, P, V, V

Solution Video | Have any Doubt ?

5 — Correct Option

Solution :
5
7 P operations, 11 V operations
$S = 1 \Rightarrow S = 1 - 7 + 11 = 5$
$\therefore$ S = 5 after the given operations.

QUESTION ANALYTICS

Q. 13

Consider a computer system with 34 bit logical address and 30 bit physical address. If the page size is 4 KB then the number of bits required to represent number of entries is an inverted page table is _____.

Solution Video | Have any Doubt ?

18 — Correct Option

Solution :
18

Physical memory size = 1 GB

$$\text{Number of entries in inverted page table} = \frac{\text{Physical address}}{\text{Page size}}$$

$$= \frac{2^{30}}{2^{12}} = 2^{18}$$

Number of bits = 18

QUESTION ANALYTICS

Q. 14

A multiprocessor with 8 processors has 20 attached tape drives. There is a large number of jobs submitted to the system and each requires 3 tape drives to complete execution. Assume that each job starts running with only 3 tape drives. The maximum number of jobs that can execute at once are _____.

Solution Video | Have any Doubt ?

6 — Correct Option

Solution :
6
If each process can be initially allocated with three tape drives. The fourth one will be allocated on demand then maximum $\left\lfloor \frac{20}{3} \right\rfloor = 6$ processes can be active simultaneously.

QUESTION ANALYTICS

Q. 15

Consider the organization of a UNIX file as represented by the inode in which there are 12 direct block pointers, a singly, doubly, and triply indirect pointer in each inode. Assume that the system block size and the disk sector size are both 8 KB. It is given that the disk block pointer is 32 bits, if no information other than that the file inode is already in main memory (file is present only in the single indirect), then the disk accesses are required to access the byte in position 13,423,956 is _____.

Solution Video | Have any Doubt ?

2 — Correct Option

Solution :
2

$$\text{Disk block address in a disk block} = \frac{8 \times 1024 \text{ B}}{4 \text{ B}}$$

The 12 direct pointers cover = 12 × 8 KB = 96 KB, means it cannot fit into direct.
The singly indirect pointer covers = 96 KB + 2048 × 8 KB = 16 MB.
So the address is in a block referenced by the singly indirect pointer.
So, this means we will need 2 disk accesses, 1st for the indirect block and
2nd for the block containing the data.

QUESTION ANALYTICS

Q. 16

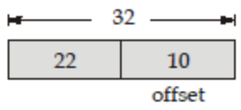
System uses virtual address space is of size 4 GB, and page size is 1 KB. The system has maximum 32 K physical pages. If each page table entry holds only a valid bit and page frame bits. The size of memory (in MB) used for page table when virtual memory uses single level paging is _____.

Solution Video | Have any Doubt ?

8 — Correct Option

Solution :
8

$$\text{Page size} = 1 \text{ KB} = 2^{10} \text{ bytes}$$
$$\text{Virtual address space} = 4 \text{ GB} = 2^{32} \text{ bytes}$$



22 bits are used for number of entries in page table.

$$\text{Page table entry} = 1 \text{ valid bit} + \text{Frame number}$$

Maximum bits needed for frame = 32 k physical frame

$$= 2^{15} = 15 \text{ bits frame}$$

$$\Rightarrow \text{Page table entry} = 1 \text{ valid bit} + 15 \text{ bits of frame}$$
$$= 16 \text{ bits} = 2 \text{ bytes}$$
$$\therefore \text{Page table size} = \text{Number of page table entries} \times \text{Entry size}$$
$$= 2^{22} \times 2 \text{ bytes}$$
$$= 8 \text{ MB}$$

QUESTION ANALYTICS

Q. 17

For the processes listed in the following table, which of the following scheduling schemes will give the lowest average turnaround time?

Processes	Arrival Time	Burst Time
1	0	10
2	18	15
3	12	8
4	20	9

Solution Video | Have any Doubt ?

A. Round Robin with quantum 6

B. SJF only

C. SRTF only

D. Both (b) and (c) — Correct Option

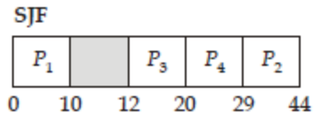
Solution :
(d)

Round Robin with quantum 6

$P_1' P_1' P_3' P_2' P_3' P_4' P_2' P_4' P_2'$

Processes	Arrival Time	Completion Time	Turn Around Time
1	0	10	10
2	18	44	26
3	12	26	14
4	20	41	21
			Average = $\frac{71}{4}$ = 17.75

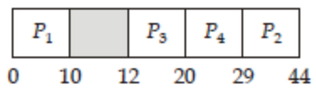
SJF



Processes	Arrival Time	Completion Time	Turn Around Time

1	0	10	10
2	18	44	26
3	12	20	8
4	20	29	9
			Average = $\frac{53}{4}$ = 13.25

SRTF



Processes	Arrival Time	Completion Time	Turn Around Time
1	0	10	10
2	18	44	26
3	12	20	8
4	20	29	9
			Average = $\frac{53}{4}$ = 13.25

QUESTION ANALYTICS

Q. 18

A computer system uses the Banker's Algorithm to deal with deadlocks. Its current state is shown in the table below, where P_0, P_1, P_2, P_3, P_4 are processes and R_0, R_1, R_2 are resources types.

Process	Maximum need			Current allocation			Available		
	R_0	R_1	R_2	R_0	R_1	R_2	R_0	R_1	R_2
P_0	7	7	4	7	5	3	1	3	2
P_1	3	5	6	3	2	2			
P_2	9	8	2	3	6	2			
P_3	2	2	2	2	1	1			
P_4	3	3	4	2	0	1			

From the perspective of deadlock avoidance, which one of the following is true?

Solution Video | Have any Doubt ?

A The system is not in safe state, but would be safe if one more instance of R_0 were available.

B The system is in safe state. Correct Option

Solution :
(b)

Process	Maximum need			Current allocation			Available			Remaining need		
	R_0	R_1	R_2	R_0	R_1	R_2	R_0	R_1	R_2	R_0	R_1	R_2
P_0	7	7	4	7	5	3	1	3	2	0	2	1
P_1	3	5	6	3	2	2				0	3	4
P_2	9	8	2	3	6	2				6	2	0
P_3	2	2	2	2	1	1				0	1	1
P_4	3	3	4	2	0	1				1	3	3

C The system is not in safe state, but would be safe if two more instance of R_2 were available.

D The system would be in unsafe state, if 1 instance of R_1 were available rather than 3.

QUESTION ANALYTICS

Q. 19

Consider the following 'C' code:

$$\left.\begin{array}{l} x = 0; \\ y = 1; \\ z = \text{true}; \end{array}\right\} \text{initialization}$$

P_1	P_2
while $(x < y)$	while (z)
$\{x = x + 1;\}$	$\{y = y + 1;\ z = (x! = y);\}$

Assume P_1 and P_2 are two concurrent processes and sharing the global variables x, y and z. Assignments and tests are atomic. Which is the following is false about P_1 and P_2 ?

Solution Video | Have any Doubt ?

A P_1 and P_2 terminates

B P_1 terminates but P_2 does not

C P_2 terminates but P_1 does not Correct Option

Solution :
(c)

Initially : $x = 0$, $y = 1$, z = true;

P_1 : 1. while $(x < y)$
2. $\{x = x + 1\}$

P_2 : 1. while (z)
2. $\{y = y + 1;$
3. $z = (x ! = y);\}$

1. Both threads terminate : is possible.
   P_2 : 1, 2
   P_1 : 1, 2, 1, 2, 1 (terminated)
   P_2 : 3, 1 (terminated)
2. P_1 terminates but P_2 does not: is possible
   P_1 : 1, 2, 1 (terminated)

P_2 : 1, 2, 3, 1, 2, 3 (infinite loop)

3. P_2 terminates but P_1 does not : is not possible
4. Neither P_1 nor P_2 terminates : is possible

P_2 : 1, 2, 3

P_1 : 1, 2

P_2 : 1, 2, 3
P_1 : 1, 2 } Infinite iterations (P_2 followed by P_1)

D Neither P_1nor P_2 terminates

QUESTION ANALYTICS +

Q. 20

Consider the following set of processes that need to be scheduled on a single CPU operating system uses preemptive shortest remaining time first algorithm. What is the average waiting time of these processes?

Process	Arrival Time	Burst Time
P_0	2	3
P_1	0	2
P_2	3	4
P_3	7	1
P_4	8	3

(All time in milliseconds)

Solution Video | Have any Doubt ?

A 1 — Correct Option

Solution :
(a)

$$\text{Waiting Time} = \text{Turn Around Time} - \text{Burst Time}$$

$$\text{Average Waiting Time} = \sum_{i=0}^{n} \frac{\text{Waiting time of } P_i}{\text{Total number of process}}$$

Process	Waiting Time
P_0	0
P_1	0
P_2	3
P_3	0
P_4	2

$$\text{Average Waiting Time} = \frac{0+0+3+0+2}{5} = 1 \text{ ms}$$

B 1.2

C 1.4

D 1.5

QUESTION ANALYTICS +

Q. 21

Consider the two process P_0 and P_1 using binary semaphore R, S, T initial value of R = 1, S = 0, T = 0.

```
        P0                          P1
    While (1)                   While (1)
{                           {
        P(R);                       P(S);
    printf("1");                printf("1");
    printf("4");                    P(T);
        V(S);                   printf("3");
    printf("2");                printf("2");
        V(T)                        V(S);
}                           }
```

What will be the output of program when process P_0 and P_1 concurrently executing?

Solution Video | Have any Doubt ?

A 1 4 1 3 2 2

B 1 4 2 1 3 2

C 1 4 1 2 3 2

D Both (b) and (c) — Correct Option

Solution :
(d)
Value of semaphore R = 1 and S = 0 so first P_0 is executed and 14 will be printed. After V(S) both P_0 and P_1 will concurrently executing and 21 or 12 can be printed. Now 32 will be printed.
Both 1 4 2 1 3 2 and 1 4 1 2 3 2 can be printed.
So option (d) is correct.

QUESTION ANALYTICS +

Q. 22

Consider the following statements:
S_1 : Pages that are shared between two or more processes can never be swapped out to the disk.
S_2 : Demand paging requires the programmer to instruct the operating system to load a particular virtual memory page.
S_3 : The translation look aside buffer is a software data structure that supports the virtual memory address translation operation.
Which of the following is correct?

Solution Video | Have any Doubt ?

A Only S_1

B Only S_1 and S_2

C Only S_1, S_2 and S_3

D None of these — Correct Option

Solution :
(d)
• Pages that are shared between two or more processes can be swapped out to disk when demand paging is applied and we have to swap in new pages and main memory is full.
• The operating system automatically loads pages from disk when necessary when it is needed
• The translation look aside buffer is a hardware data structure.

QUESTION ANALYTICS +

Q. 23

To obtain better memory utilization, dynamic loading is used. A routine is not loaded until it is called. For implementing dynamic loading, which of the following is correct?

Solution Video | Have any Doubt ?

A All routine are kept on memory in a relocatable load format.

B All routines become part of the code and are loaded at the same time regardless of whether they are called or not.

C Both (a) and (b)

D Dynamic loading optimizes memory space utilization. — Correct Option

Solution :
(d)
The purpose of dynamic loading is optimal utilization of memory.
Option (a) all routine are kept on disk in a relocatable load format.
Option (b) is property of static loading

QUESTION ANALYTICS +

Q. 24

Consider the following segment:

```
int count = 0;
void tally( )
{
    for (int i = 1; i <=5; i++)
        count = count +1;
}
main( )
{
    parbegin
        tally( );
        tally( );
        tally( );
    parend
}
```

Note: Assume the count = count + 1; will execute in '3' different instructions.

I. Load R_i, m[count]
II. INC R_i
III. Store m[count], R_i

where m[count] refers to memory value of count variable.
Preemption can occur while executing the above instructions. Each of the tally function has a separate register R allocated to it in which the value of count is stored. After completion of main function, what will be the minimum and maximum values of count in the end of the program?

Solution Video | Have any Doubt ?

A min = 5, max = 15

B min = 2, max = 15 — Correct Option

Solution :
(b)
• To get the minimum value of count.

Tally1( )	Tally2( )	Tally3( )	
Iteration 1. I: count = 0, R_1 = 0			
II: count = 0, R_1 = 0			
	Iteration 1. count = 1, R_2 = 1		
	2. count = 2, R_2 = 2		
	3. count = 3, R_2 = 3		
	4. count = 4, R_2 = 4		
	5. count = 5, R_2 = 5		
		Iteration 1. count = 6, R_3 = 6	
		2. count = 7, R_3 = 7	
		3. count = 8, R_3 = 8	Time
		4. count = 9, R_3 = 9	
Iteration 1. III: count = 1, R_1 = 1			
		Iteration 5. I: count = 1, R_3 = 1	
		II. count = 1, R_3 = 2	

Iteration 2. count = 2, $R_1 = 2$
3. count = 3, $R_1 = 3$
4. count = 4, $R_1 = 4$
5. count = 5, $R_1 = 5$

Iteration 5. III: count = 2, $R_3 = 2$

- To get the maximum value, execute P_1, P_2 and P_3 completely in sequence.

∴ Count = 15.

C min = 15, max = 15

D min = 3, max = 15

QUESTION ANALYTICS

Q. 25

Which of the following is true?

Solution Video | Have any Doubt ?

A The CPU utilization always increases as the degree of multiprogramming increases.

B Test and set is used to implement lock/unlock to avoid busy wait.

C Kernel level threads are faster to switch among them than user level thread.

D None of the above — Correct Option

Solution :
(d)
(a) The CPU utilization increases as the degree of multiprogramming increase up to threshold (some limit), after that utilization start decreasing.
(b) Test and set is a special hardware instruction that does two operations atomically but does not to avoid busy wait.
(c) User level threads are faster to switch among them than kernel level thread since user level thread have less context.

QUESTION ANALYTICS

Q. 26

Which of the following statement in incorrect about the synchronization mechanism?

Solution Video | Have any Doubt ?

A Bounded waiting is always satisfied if there are only two process. — Correct Option

Solution :
(a)
(a) Bounded waiting does not always satisfied if there are only two process.
(b) If there is deadlock then progress is not satisfied, if progress is satisfied there is no deadlock.
(c) With the improper use of semaphore variable in the implementation solution can have deadlock.

B If any solution is satisfying the progress condition, then it will not have any deadlock.

C Deadlock can not be always avoided using semaphore.

D None of these

QUESTION ANALYTICS

Q. 27

Consider a paged virtual memory system with 32-bit virtual addresses and 1 KB page size. Each page table entry requires 32 bits. It is desired to limit the page table size to one page. Assume multi level paging is used to implemented the above requirement then how many levels are required?

Solution Video | Have any Doubt ?

A 5

B 2

C 4

D 3 — Correct Option

Solution :
(d)

$$\text{Page table size of } 1^{st} \text{ level} = \frac{2^{32}\text{B}}{2^{10}\text{B}} \times 4\text{B}$$

$$= 2^{24}\text{ B} > 1\text{ KB}$$

$$\text{Page table size of } 2^{nd} \text{ level} = \frac{2^{24}\text{B}}{2^{10}\text{B}} \times 4\text{B}$$

$$= 2^{16}\text{ B} > 1\text{ KB}$$

$$\text{Page table size of } 3^{rd} \text{ level} = \frac{2^{16}\text{B}}{2^{10}\text{B}} \times 4\text{B}$$

$$= 2^{8}\text{ B} < 1\text{ KB}$$

So 3 level of page table required.

QUESTION ANALYTICS

Q. 28

Consider the page reference string:
1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6 with number of frames be 4.
The number of page faults when using FIFO technique be x, Optimal technique be y, LRU technique be z. Which of the following is true?

Solution Video | Have any Doubt ?

A $x < y < z$

B $y < z < x$ — Correct Option

Solution :
(b)

(a) LRU replacement:

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

Page fault = 10

(b) FIFO replacement:

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

Page fault = 14

(c) Optimal replacement:

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

Page fault = 8

C $y = z < x$

D $y < x = z$

QUESTION ANALYTICS

Q. 29

A translational look aside buffer is a hardware device used for speeding up the conversation from virtual address to physical address. Consider a memory management unit where a memory reference takes 500 nanoseconds; TLB (Translation Look aside Buffer) reference takes 40 nanoseconds; and the hit-rate achieved with the use of TLB is 80%. The difference of Effective Access Time between TLB technique and pure paging with no TLB is _____.

Solution Video | Have any Doubt ?

360 — Correct Option

Solution :
360

$$\begin{aligned} \text{EAT with TLB} &= x(\text{TLB} + \text{Tm}) + (1 - x)(\text{TLB} + 2\,\text{Tm}) \\ &= 0.8\,(40 + 500) + 0.2\,(40 + 2 \times 500) \\ &= 640 \text{ ns} \\ \text{EAT using pure paging} &= 2 \times \text{Tm} = 2 \times 500 = 1000 \text{ ns} \\ \text{Now their difference} &= 1000 - 640 = 360 \text{ ns} \end{aligned}$$

QUESTION ANALYTICS

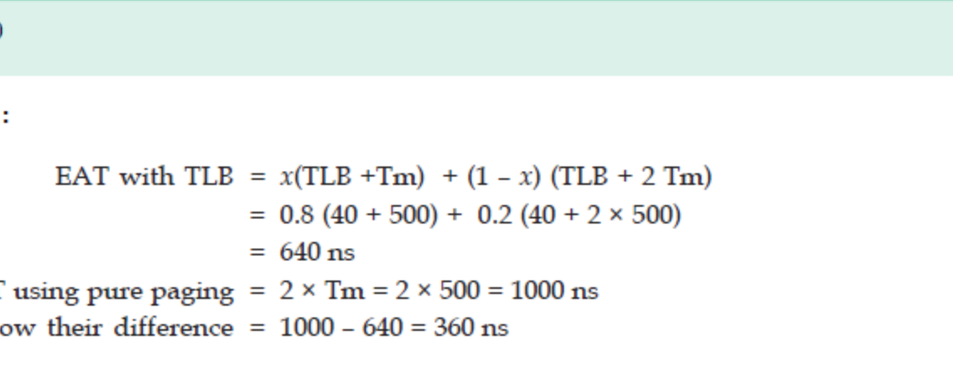
Q. 30

Consider a disk has 200 cylinders, numbered from 0 to 199. At some time the disk arm is at cylinder 100, and moving towards right direction. There is a queue of disk access requests for cylinders 30, 85, 110, 100, 105, 126, 135, 55 and 195. What will be the distance traversed by the R/W head when CSCAN algorithm is used _____.

Solution Video | Have any Doubt ?

383 — Correct Option

Solution :
383



Total distance traversed by R/W head = (105 – 100) + (110 – 105) + (126 – 110) + (135 – 126) + (195 – 135) + (199 – 195) + (199 – 0) + (30 – 0) + (55 – 30) + (85 – 55)

$$= 5 + 5 + 16 + 9 + 60 + 4 + 199 + 30 + 25 + 30$$
$$= 383$$

QUESTION ANALYTICS

Q. 31

Consider a computer system having 30 physical frames, numbered from 1 to 30 which are initially empty. Now, a program accesses the page numbered (1, 2 ..... 80, 80, 79, ... 2, 1). The number of page faults generated by least recently used page replacement policy _____.

Solution Video | Have any Doubt ?

130 — Correct Option

Solution :
130
Initially, there is compulsory miss from page number 1 to 30, at 31 there is miss page and page 1 is replaced and so on. Total 80 page fault.
On second access of 80 there is hit from 80 to 51. After 50 to 1 there are total 50 page faults.

Total page fault = 80 + 50 = 130

QUESTION ANALYTICS

Q. 32

Consider the following statements:
S_1 : For a system to be in deadlock only mutual exclusion, hold and wait and no preemption condition must be satisfied.
S_2: If each resource type has exactly one instance and if resource-allocation graph contain a cycle then the system may or may not be in deadlock.
How many number of statement is/are correct _____.

Solution Video | Have any Doubt ?

0 — Correct Option

Solution :
0
S_1: For a system to be in deadlock four condition mutual exclusion, hold and wait, no preemption and circular wait must be satisfied. S_1 is incorrect
S_2: If each resource type has single instance then cycle in resource allocation graph implies deadlock.

QUESTION ANALYTICS

Q. 33

Consider the following 3 programs Program 1, Program 2, Program 3 with execution time of process-a, process-b, process-c being 2 ms, 3 ms and 4 ms respectively:

Program 1	Program 2	Program 3
begin process-a Lock(x) process-c Unlock(x) process-b end	begin process-a Lock(x) Lock(y) process-c Unlock(y) Unlock(x) process-b end	begin process-a Lock(y) Lock(x) process-c Unlock(x) Unlock(y) process-b end

Program	Arrival Time	Priority
1	0	1 (lowest)
2	3	5
3	10	10 (highest)

Assume x and y are locks initially in Free state i.e. set to 0 and Lock(x) make x = 1 i.e. Busy state and Unlock(x) make x = 0 i.e. Free state and preemptive priority scheduling is used. Then the average turnaround time of Program 1, 2 and 3 is _____. (Upto 2 decimal places)

Solution Video | Have any Doubt ?

19.66 [19.65 - 19.67] — Correct Option

Solution :
19.66 [19.65 - 19.67]

	0	2	3	5	8	10	12	14	18	21	24	27
P_1	a	c		c								b
P_2			a		c		c			b		
P_3						a		c	b			

$$\text{Average Turn Around Time} = \frac{(27-0)+(24-3)+(21-10)}{3} = 19.66$$

QUESTION ANALYTICS