GATE Computer Science –IT

15 Years

Detailed Solutions

Subject & Topic-wise

3 Full Length Mock Test

- ✓ Error free Detailed Solutions
- ✓ Special Focus on Repeated Questions with fewer Changes
- ✓ Alternate Methods & Shortcuts Methods

Anshul Sawant Rank : 1st (AIR) GATE 2011

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DBMS

1. ER Model
2. Functional Dependencies and Normalities
3. SQL
4. Relational Algebra and Calculus
5. Transactions and Concurrency Control
6. File Structures and Indexing

TOC

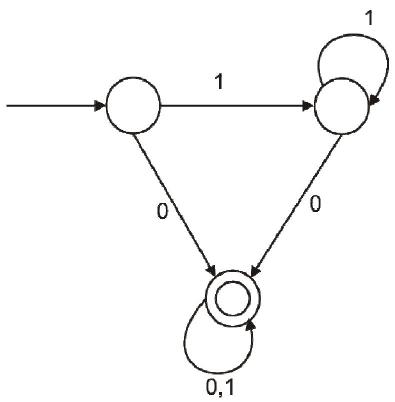
1. Regular Language and F.A
2. CFL and PDA
3. CSL, REC, RE and TM
4. Undecidability and NP – Completeness

Regular Languages And Finite Automata

1. Consider the languages $L_1=\Phi$ and $L_2=\{a\}$. which one of the following represents $L_1L_2^* \cup L_1^*$?

   (A.) $\{\varepsilon\}$ (B.) Φ (C.) a* (D.) $\{\varepsilon,a\}$ **(GATE: 2013)**

2. Consider the DFA A given below.



   Which of the following are FALSE? **(GATE : 2013)**

   1. Complement of L(A) is context – free
   2. L(A) = L(11*0+0)(0 +1)*0*1*)
   3. for the language accepted by A, A is the minimal DFA
   4. A accepts all string over {0, 1} of length at least 2

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(A.) 1 and 3 only (B.) 2 and 4 only (C.) 2 and 3 only (D.) 3 and 4only

3. Given the language L – {ab, aa, baa}, which of the following strings are in L*? **(GATE : 2012)**
(1.) abaabaaabaa
(2.) aaaabaaaa
(3.) baaaaabaaaab
(4.) baaaaabaa

(a) 1,2 and 3 (b) 2,3 and 4 (c) 1,2 and 4 (d) 1,3 and 4

Operating System

1. CPU Scheduling

2. Dead Locks

3. Process Synchronization

4. Process Management

5. Memory Management

6. Virtual Memory

7. File & Disk Management

CPU Scheduling

1. A scheduling algorithm assigns priority proportional to the waiting time of a process. Every process starts with priority zero (the lowest priority). The scheduler re – evaluates the process priorities every T time units and decides the next process to schedule. Which one of the following is TRUE if the processes have no I/O operations and all at time zero? **GATE-2013**

(A.) This algorithm is equivalent to the first – come – serve algorithm.

(B.) This algorithm is equivalent to the round – robin algorithm.

(C.) This algorithm is equivalent to the shortest – job – first algorithm.

(D.) This algorithm is equivalent to the shortest – remaining – time – first algorithm

2. Consider the 3 process, P1, P2 and P3 shown in the table.

Process	**Arrival Time**	**Time units Required**
P1	0	5
P2	1	7
P3	3	4

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The completion order of the 3 processes under the policies FCFS and RR2 (round robin scheduling with CPU quantum of 2 time units) are **GATE-2012**

(a) **FCFS**: P1, P2, P3 **RR2** : P1, P2, P3

(b) **FCFS**: P1, P3, P2 **RR2** : P1, P3, P2

(c) **FCFS**: P1, P2, P3 **RR2** : P1, P3, P2

(d) **FCFS**: P1, P3, P2 **RR2** : P1, P2, P3

3. Consider the following table of arrival time and burst time for three processes P0,P1 and P2.

GATE-2011

PROCESS	**Arrival time**	**Burst Time**
P0	0 ms	9 ms
P1	1 ms	4 ms
P2	2 ms	9 ms

The pre-emptive shortest job first scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes. What is the average waiting time for the three processes?

(a.) 5.0 ms (b.) 4.33ms (c.) 6.33ms (d.) 7.33ms

4. Which o the following statements are true? **GATE-2010**

(I.) Shortest remaining time first scheduling may cause starvation

(II.) Preemptive scheduling may cause starvation

(III.) Round robin is better than FCFS in terms of response time

(A.) I only (B.) I and III only

(C.) II and III only (D.) I, II and III

5. In which one of the following page replacement policies, Belady's anomaly may occur?

(a) FIFO (b) Optimal (c) LRU (d) MRU **GATE-2009**

6. Group 1 contains some CPU scheduling algorithms and Group 2 contains some applications. Match entries in Group 1 entries in Group 2. **GATE-2007**

Group 1	**Group 2**
P. Gang scheduling	1. Guaranteed Scheduling
Q. Rate Monotonic Scheduling	2 . Real-time Scheduling
R. Fair Share Scheduling	3 . Thread Scheduling

(a) P -3; Q -2 ; R -1 (b) P -1 ; Q -2 ; R-3

(c) P-2 ; Q=3 ;R -1 (d) P-1 ;Q -3 ; R-2

7. An operating system uses Shortest Remaining Time first (SRT) process scheduling algorithm. Consider the arrival times an execution times for the following processes: **GATE-2007**

Process Execution time Arrival time

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P1	20	0
P2	25	15
P3	10	30
P4	15	45

What is the total waiting time for process P2?

(a) 5 (b) 15 (c) 40 (d) 55

8. Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end. **GATE-2006**

(a.) 1
(b.) 2
(c.) 3
(d.) 4

9. Consider three processes (process id 0, 1, 2 respectively) with compute time bursts 2, 4 and 8 time units. All processes arrive at time zero. Consider the longest remaining time first (LRTF) scheduling algorithm. In LRTF ties are broken by giving priority to the process with the lowest process id. The average turn round time is:

(a.) 13 units
(b.) 14 units
(c.) 15 units
(d.) 16 units

10. 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? **GATE-2006**

(a.) 0% (b.)10.6% (c.)30.0% (d.)89.4%

11. Consider the following set of processes, with the arrival times and the CPU-burst times given in milliseconds. **GATE-2004**

process	Arrival time	Burst time
P1	0	5
P2	1	3
P3	2	3
P4	4	1

What is the average turnaround time for these processes with the pre-emptive shortest remaining processing time first (SRPT) algorithm?

(a.) 5.50 (b.) 5.75 (c.) 6.00 (d.) 6.25

12. A uni-processor computer system only has two processes, both of which alternate 10 ms CPU bursts with 90 ms I/O bursts. Both the processes were created at nearly the same time. The I/O of both processes can proceed in parallel. Which of the following scheduling strategies will result in the least CPU utilization (over a long period of time) for this system? **GATE-2003**

(a) First come fist served scheduling

(b) Shortest remaining time first scheduling

(c) Static priority scheduling with different priorities for the two processes

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(d) Round robin scheduling with a time quantum of 5 ms

Dead Lock

13. A system has n resources $R_0, \ldots, R_{n-1}$, and k processes $p_0, \ldots, p_{k-1}$. The implementation of the resource request logic of each process P_i . is as follows :

If (i%2 = =){

If (i<n) request R_i;

SOLUTION:

CPU Scheduling

1. (B) The algorithm best suited for this kind of scheduling algorithm is round-robin algorithm, because on every T time units the algorithm dynamically decides the next process to schedule as well as every process starts with priority zero (0).

2. (C)

3. (A)

4. (D) **Statement I:** Shortest remaining time first (SRTF) scheduling may cause starvation is TRUE, because a process having greater CPU burst will take its turn after a longer time.
Statement II: Preemptive scheduling may cause starvation is TRUE, because it may be the case that one process may be preemptive by another processes each of the time as well as SRTF can also be preemptive. So the same analogy, we can use to prove this statement TRUE.

Statement III: Round Robin (RR) scheduling is better than FCFS in terms of response time is also TRUE, because after passing time quantum (generally we take less time quantum than the required CPU burst) we can get response from other processes, even though the previous one is not finished yet. So, all statements are TRUE.

5. (A) Belady's anomaly says that increasing the number of pages may not ensure us to decreasing of page faults, FIFO suffer from Belady's anomaly.

6. (A) A. Gang Scheduling $\rightarrow$ Thread Scheduling

B. Rate Monotonic Scheduling $\rightarrow$ Real-time Scheduling

C. Fair Share Scheduling $\rightarrow$ Guaranteed Scheduling

7. (B) The Gantt chart for all the processes is as follows:

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P_1	P_2	P_3	P_2	P_4

0 20 30 40 55 70

From this chart process P_2 get its first turn at time 20, arrived at time 15, means 5 time is waiting; for the next turn at time 40, which says that from time 30 to time 40 this process is waiting. So, total waiting time is 15.

8. (B)

Processes	CPU burst time	Arrival time
P_0	10	0
P_1	20	2
P_2	30	6

Shortest remaining time first scheduling is used for CPU scheduling.
The corresponding Gantt chart is as follows:

P_0	P_1	P_2

From the chart, we can find that total 2 context switches occurred.

9. (A)

Processes	CPU burst time	Arrival time
P_0	2	0
P_1	4	0
P_2	8	0

Scheduling algorithm is longest remaining time first (LRTF), with restriction that whenever there is a tie among processes, it can be broken by giving the priority to the lowest process *id.*
The Gantt chart of the scheduling algorithm is

4 3 3 2 2 1 1 1 0 0 0

P_2	P_1	P_2	P_1	P_2	P_0	P_1	P_2	P_0	P_1	P_2

0 4 5 6 7 8 9 10 11 12 13 14

Turnaround time

$P_0 = 12$ $P_1 = 13$ $P_2 = 14$

$\therefore$ Average turnaround time = $\frac{39}{3} = 13$ units

10. (B)

Processes	Arrival time	Execution time	Order of their time spent: I/O	Computation	I/O
P_0	0	10	2	7	1
P_1	0	20	4	14	2
P_2	0	30	6	21	3

Scheduling algorithm = Shortest remaining compute time first scheduling
The Gantt chart of the processes is as follows:

CPU idle	P_0	P_1	P_2	Idle time of CPU

0 2 9 23 44 47

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The percentage of time CPU remains idle is $\Rightarrow \frac{2+3}{47} = \frac{5}{47} = 10.6\%$

11. **(A)**

Process	Arrival time	Burst time
P_1	0	5
P_2	1	3
P_3	2	3
P_4	4	1

Preemptive shortest remaining processing time first algorithm.

P_1	P_2	P_2	P_2	P_4	P_3	P_3	P_3	P_1	P_1	P_1	P_1

0 1 2 3 4 5 6 7 8 9 10 11 12

Turnaround of every process:

$P_1 = 12$ $P_2 = 3$ $P_3 = 6$ $P_4 = 1$

$\therefore$ Average turnaround time = $\frac{12+3+6+1}{4} = \frac{22}{4} = 5.50$

Computer Networks

1. Introduction, Physical Later, DLL

2. Network Layer (IP)

3. Transport Layer (TCP, UDP)

4. Upper Layers, Network Security

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