Software

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The Course Outline

Course Outline

- **Course Title:** Preparation course for FE examination
- **Intended Participants:** University Students who are going to take ITPEC examinations
- **Course Duration:** 60 hours

Lecture Plan: Morning Exam, Sec 2-Computer System, Chapter 3-Software

Time	Learning Points/Key	Explanation Points	Method	Level	Note
10 minutes	Operating systems	System software, UNIX, OS for PCs, Open OS, Microkernel, Monolithic kernel	Verbal Explanation	High	
		Middleware, Kernel mode (Supervisor mode), User mode, Service program, Process management, Spooling			
		Operations management, Interrupt, Multiprogramming, Reader, Job scheduler, Initiator, Terminator			
		Master scheduler, Writer, Batch processing, Ready state, Running state, Waiting state			
		Process, Preemptive, Non-preemptive, Time slice, Priority scheduling, Round robin, Time quantum			
		Channel, I/O interrupt, Roll-in, Roll-out, Swap-in, Swap-out, Overlay (Segment), Garbage collection			
		Dispatch, Compaction, Base address, Segment, Paged segment, Thrashing, Dynamic address translation			
		Page fault, Page replacement, LRU, FIFO			
10 minutes	Middleware	Linking software between application programs, DBMS, Communication management system	Verbal Explanation	Low	
		Software development support tool, Operations management tool, TP (Transaction Processing) monitor			
		Shell, API, Component, JavaBeans, ActiveX, CORBA			
10 minutes	File systems	Root directory, Current directory, Search techniques, FAT file system, NTFS	Verbal Explanation	Low	
		HFS (Hierarchical File System), Volume, Multiple backups, Full backup, Differential backup			
10 minutes	Development tools	CASE tool, Testing tool, Emulator, Simulator, ICE (In-Circuit Emulator), Tracer, Inspector, Snapshot		Medium	
		Assertion checker, Assembler, Interpreter, Linker, Loader, Compiler			
		Cross compiler, Generator, Preprocessor, Source program, Object program, Load module			
10 minutes	Open source software	Linux kernel, Python, Copyleft, Dual license, GPL (General Public License)	Verbal Explanation	Medium	
		BSDL (Berkeley Software Distribution License), MPL (Mozilla Public License)			
		UnixWare, FreeBSD (Free Berkley Software Distribution), OpenBSD, The Open Group			

Objectives

3.1 Understand Operating systems***

- Understand the types, characteristics, functions, and configurations of operating systems, and apply them to associated matters.
- Understand the management mechanisms for typical functions of operating systems, such as job management, task management, and memory management, and apply them to associated matters.

3.1 Understand Operating systems***

- System software, UNIX, OS for PCs, Open OS, Microkernel, Monolithic kernel, Middleware, Kernel mode (Supervisor mode), User mode, Service program, Process management, Spooling, Operations management, Interrupt, Multiprogramming, Reader, Job scheduler, Initiator, Terminator , Master scheduler, Writer, Batch processing, Ready state, Running state, Waiting state, Process, Preemptive, Non-preemptive, Time slice, Priority scheduling, Round robin, Time quantum, Dispatch, Channel, I/O interrupt, Roll-in, Roll-out, Swap-in, Swap-out, Overlay (Segment), Garbage collection, Compaction, Base address, Segment, Paged segment, Thrashing, Dynamic address translation, Page fault, Page replacement, LRU, FIFO

3.2 Understand Middleware

- Understand the role and basic functions of typical middleware, and apply them to associated matters.

Keywords

3.2 Understand Middleware

- Linking software between application programs, DBMS, Communication management system, Software development support tool, Operations management tool, TP (Transaction Processing) monitor, Shell, API, Component, JavaBeans, ActiveX, CORBA

3.3 File systems

- Understand the mechanism of file management by arrangement in hierarchies, and apply them to associated matters.
- Understand the types and characteristics of file systems, and apply them to associated matters.
- Understand the types and typical characteristics of file organization, access methods, and backup methods, and apply them to associated matters.

3.3 File systems

- Root directory, Current directory, Search techniques, FAT file system, NTFS, HFS (Hierarchical File System), Volume, Multiple backups, Full backup, Differential backup

3.4 Understand Development tools**

- Understand the types, characteristics, and basic functions of basic development tools used in software development, and apply them to associated matters.

3.4 Understand Development tools

- CASE tool, Testing tool, Emulator, Simulator, ICE (In-Circuit Emulator), Tracer, Inspector, Snapshot , Assertion checker, Assembler, Interpreter, Linker, Loader, Compiler, Cross compiler, Generator, Preprocessor, Source program , Object program, Load module

3.5 Understand Open source software**

- Understand the types, typical characteristics, considerations for use, and trends of open source software, and apply them to associated matters.

Keywords

3.5 Understand Open source software**

- Linux kernel, Python, Copyleft, Dual license, GPL (General Public License), BSDL (Berkeley Software Distribution License), MPL (Mozilla Public License), UnixWare, FreeBSD (Free Berkley Software Distribution) , OpenBSD, The Open Group
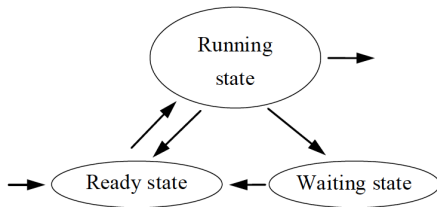
Analyzation

Analyzation

- Analyzed 20 questions
- Covered the most recent years
 - 2021 Q1 Exam
  - 2021 Q2 Exam

Questions

Question 1

Q1. (q2-42) The diagram below shows the state transition of a task in a multitasking computer. Which of the following is an event that causes the state to change from "running" to "ready"?

- **a.** A task with a higher priority is set to the ready state.
- **b.** A task is generated.
- **c.** The processing based on an I/O request is completed.
- **d.** An I/O request is issued.

Q1. (q2-42) The diagram below shows the state transition of a task in a multitasking computer. Which of the following is an event that causes the state to change from "running" to "ready"?
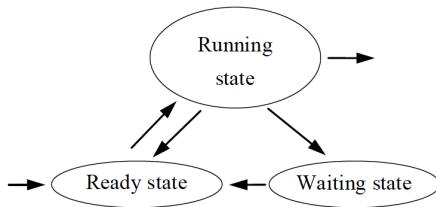
Theme: Software, Category: FE

- a. A task with a higher priority is set to the ready state.
- b. A task is generated.
- c. The processing based on an I/O request is completed.
- d. An I/O request is issued.

- In control for multitasking, a task within a system is managed based on three states: the **"running state"** is when the task in the system is being performed, the **"ready state"** is when the task can be executed at any time, but its execution is awaited because the CPU is busy, and the **"waiting state"** when I/O processing is being performed and its completion is awaited. A figure that shows the transition of these three states is called a state transition diagram of tasks (processes). When a task with a higher priority is set to the ready state, the task in the running state is dispossessed of the right to use the CPU and is set to the ready state.
  Therefore, a) is the correct answer.
  Such task switching (involving the appearance of a task with a high priority) is called **preemption**.
- b) A task that is generated is first set to the ready state.

- c) When the processing of an I/O request ends, transition takes place from the waiting state to the ready state.

- d) When an I/O request is issued, transition takes place from the running state to the waiting state in order to await the completion of the request.

Question 2

Q2. (q2-44) Which of the following is a task scheduling algorithm where a specific task has a high possibility of waiting indefinitely for the allocation of CPU resources?

a. The priority of each task is determined and the tasks are executed from the highest priority to the lowest. However, the priority is increased gradually according to the length of time waiting for CPU allocation.

b. Each task is executed according to the order in the CPU queue, and once a fixed period of time has elapsed, the execution of a task is suspended and it is appended to the end of the CPU queue.

c. Processing is performed from the task with the shortest expected processing time. When the processing that is currently being executed is completed or suspended for some reason, the next task is started.

d. Tasks are appended to the end of the ready queue in order of arrival at the system, and the CPU is always allocated to the first task in the ready queue.

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- The scheduling algorithm by which processing is executed in order starting from the task (job) with the shortest expected processing time is called the **SJF (Shortest Job First)** algorithm. This algorithm is suitable for preferentially processing tasks that need to be handled immediately, such as online real-time processing, however, when tasks with a short expected processing time arrive in the CPU resource queue in quick succession, the tasks with a long expected processing time wait indefinitely for the allocation of CPU resources, and might not be processed for a long time.
  Therefore, c) is appropriate.

- a) The scheduling algorithm where multiple CPU resource queues are created according to task priority and CPU resources are allocated sequentially starting with the tasks with the highest priority is called **priority scheduling**. The problem with this algorithm is that CPU resources are not allocated to tasks with a lower priority very often. The process of gradually increasing the priority according to the length of the waiting period so as to deal with this problem is called **aging**.

- b) The limited time period for which the CPU can be used is called a **time quantum or time slice**. The scheduling algorithm by which the execution of a task is suspended once the limited time period is reached and the task is appended to the end of the CPU resource queue is called the **round robin algorithm**. The tasks in the CPU resource queue are processed in sequence, and the allocation of CPU resources to the tasks is ensured.

- d) This is an algorithm by which tasks are processed in order of arrival, and it is called **FIFO (First In First Out)**. Although the subsequent tasks are made to wait, once a certain amount of time has elapsed, CPU resources are eventually allocated to the subsequent tasks as well.

Question 3

Q3. (q2-45) There are three CPU-bound jobs A, B, and C. When these jobs are executed separately, the processing time is 5 minutes for job A, 10 minutes for job B, and 15 minutes for job C. When these three jobs are executed concurrently based on the scheduling algorithm described below, approximately how long (in minutes) does it take to complete job B?

[Scheduling algorithm]

1. If a job does not finish within a fixed period of time (called a time quantum), it is suspended and moved to the end of the queue.
2. Jobs are executed in queueing order.
3. The time quantum has a sufficiently smaller value in comparison with the processing time of a job.
4. The switching time between jobs is ignored.

a. 15
b. 20
c. 25
d. 30

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a. 15
b. 20
c. 25
d. 30

- Since a time quantum is a significantly smaller value in comparison with the processing time of a job, almost the same CPU time is allocated to jobs that are executed simultaneously.

- First, the three jobs A through C are executed by allocating a time quantum with the round robin algorithm.

- Therefore, approximately three times the amount of time taken to execute the jobs separately is needed.

- As such, the time that elapses before the completion of job A (which has the shortest processing time) is 5 (minutes) $\times$ 3 = 15 (minutes). After the completion of job A, job B and job C are executed simultaneously.

- The time that elapses during this period is approximately twice the time taken to execute the jobs separately.

- Therefore, the time taken until the completion of job B is twice the "remaining time of job B" that is 5 (minutes) $\times$ 2 = 10 (minutes). Following this, job B (that has the shortest processing time after job A) is completed, and finally, job C is executed by itself.

- In this question, the time that elapses before the completion of job B must be determined.
  This is 15 + 10 = 25 (minutes), and therefore, c) is the correct answer.
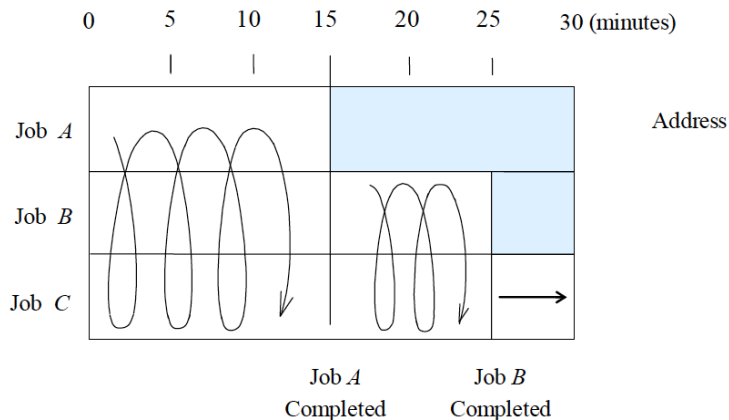
Question 4

Q4. (q2-46) When a virtual memory system does not have enough main memory, which of the following is the state in which the overheads of the system increase and the processor utilization by applications decreases if the number of programs running concurrently is increased?

- a. Thrashing
- b. Fragmentation
- c. Paging
- d. Bottleneck

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- In a virtual memory system, if a program in the virtual memory is larger than the main memory area that can be used in the system, or the number of programs running concurrently is large, paging is performed very frequently. This is called **thrashing** as described in a) and causes the efficiency of the entire system to decrease.

- b) **Fragmentation:** This is a state in which the memory inside the storage device is fragmented and a continuous area of the required size cannot be secured, and as a result, a series of memory areas are arranged in a scattered manner. Frequent writing to the storage device and deletion of content causes this state to progress, leading to a decline in system efficiency.

- c) **Paging:** In a virtual memory system, when no space is available in the real memory, the programs in the real memory that are not necessary for the time being are pushed out to an auxiliary storage device (page-out), and a program that might be necessary the next time is imported into that area (page-in). These two operations are called paging. Pages that are paged out are stored and managed at a location called a slot on the auxiliary storage device.

- d) **Bottleneck:** It is a phenomenon in which the performance or capacity of an entire system is severely limited by a resource with the highest amount of load, and which hinders development in situations such as the development of a system.

Question 5

Q5. (q2-48) Which of the following is an effect that is achieved by a virtual memory system?

a. The effective access speed of the main memory increases.

b. The apparent capacity of the main memory increases.

c. The power consumption decreases.

d. The information in main memory is not erased even if the power is turned off.

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- a. The effective access speed of the main memory increases.
- b. The apparent capacity of the main memory increases.
- c. The power consumption decreases.
- d. The information in main memory is not erased even if the power is turned off.

- A virtual memory system is a mechanism for providing an address space larger than the capacity of the actual main memory by using an auxiliary storage device.
  Therefore, b) is the correct answer.
  In a virtual memory system, a program is divided into several parts beforehand, and only the parts necessary for processing are loaded to the main memory so as to enable the execution of a program with a larger size than the actual memory capacity. The methods for the division of a program include "segmentation" by which a program is divided into meaningful functional units, and "paging" by which a program is divided simply into fixed units (such as 4 KB).

- a) There is no effect on access speed to the main memory. To be exact, in some cases there is a delay equal to the processing time for dynamic address translation. Furthermore, in the virtual memory system, if the physical memory capacity is lower, the divided program is replaced frequently, which increases the required processing time, thus resulting in a delay in the effective access speed of the main memory.

- c) Although in some cases the power consumption of the entire system increases by as much as the amount of usage of the auxiliary storage device, there is no reduction in the power consumption of the main memory.

- d) Non-volatility is the ability to retain stored content even when the power is turned off. Normally, auxiliary storage devices are non-volatile and the main memory is volatile, and this holds true even for a virtual memory system.

Question 6

Q6. (q2-49) In a paging-based virtual memory system, the LRU algorithm is used for page replacement. When pages 1, 2, 3, 4, 5, 2, 1, 3, 2, and 6 are accessed in this order by using four page frames that are allocated to the main memory, which of the following is the page that is replaced when page 6 is accessed? Here, no page exists in the main memory in the initial state.

- a. 1
- b. 2
- c. 4
- d. 5

Q6. (q2-49) In a paging-based virtual memory system, the LRU algorithm is used for page replacement. When pages 1, 2, 3, 4, 5, 2, 1, 3, 2, and 6 are accessed in this order by using four page frames that are allocated to the main memory, which of the following is the page that is replaced when page 6 is accessed? Here, no page exists in the main memory in the initial state.

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- a. 1
- b. 2
- c. 4
- d. 5

According to the LRU algorithm, the page that is not used for the longest time is paged out. In this question, the state of page referencing and page replacement is arranged in a table in view of the fact that "no page exists in the main memory in the initial state". As a result, it is clear that when page 6 is accessed at the end, it is stored at the position where page 5 was stored. Therefore, d) is the correct answer.

	1	2	3	4	5	6	7	8	9	10
1	**1**	1	1	1	**5**	5	5	5	(5)	**6**
2		**2**	2	2	2	**2**	2	2	**2**	2
3			**3**	3	3	3	**1**	1	1	1
4				**4**	4	4	4	**3**	3	3

Vertical axis: Page frame   Horizontal axis: Access frequency

Question 7

Q7. (q2-50) Which of the following is an appropriate explanation of the spooling function?

a. When a task is being executed, the CPU is allocated to another task if the CPU switches to the idle state as a result of the execution of an I/O instruction.

b. The program being executed is temporarily suspended, and control is transferred to the control program.

c. By performing data transfer between main memory and a low-speed I/O device via an auxiliary storage device, the throughput of the entire system is improved.

d. By providing a buffer pool that consists of multiple buffers and increasing the probability of accessing the buffer in main memory, the access time for the auxiliary storage is reduced.

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- The spooling (spool) function refers to the I/O process of data using a spool area. The spool area is the storage area for an auxiliary storage device that plays the role of a buffer for releasing the CPU from the I/O operation of a low-speed device.
  For example, the data to be output to a printer is first stored on a high-speed hard disk device (spool area), and then output to the target printer. In this way, the program can be ended when the data is written to the spool area, and another process can be started. By quickly separating the program from a low-speed I/O device such as a printer, the number of programs that can be executed concurrently can be increased and the low-speed I/O device and CPU can be used effectively, which improves the throughput of the entire system. Therefore, c) is the correct answer.
- a) This is a description concerning scheduling of tasks.
- b) This is a description concerning interrupt.

- d) This is a description concerning buffering that is used when a disk is accessed. A disk cache also achieves a comparable function.

Question 8

Q8. (q2-51) A computer takes 200 nanoseconds for a single access to main memory, and has an overhead of 100 milliseconds for each page fault. When a page fault occurs once every 500,000 accesses to the main memory, which of the following is the maximum number of page faults per second? Here, factors other than the page fault overhead are ignored in the calculation.

- a. 3
- b. 4
- c. 5
- d. 6

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- a. 3
- b. 4
- c. 5
- d. 6

According to the conditions in the question, a single access to the main memory is performed in 200 nanoseconds, and the overhead for a single page fault is 100 milliseconds. Furthermore, a page fault occurs once every 500,000 accesses to the main memory. Based on this, if the average time required to access the main memory 500,000 times is calculated by including the overhead for the one page fault that is expected to occur during this time, it is calculated as the sum total of the time required for 500,000 accesses and the overhead due to the page fault, which is 2×10^{-1} (seconds), as shown below:

Time required for accessing the main memory 500,000 times $=$
$50 \times 10^4 \times 200 \times 10^{-9}$
$= 10^{-1}$ (seconds)

Page fault $= 100$ milliseconds $= 10^{-1}$ (seconds)

The numeric value to be obtained is the maximum number of page faults per second, but since a page fault occurs every 500,000 accesses to main

memory, the time period necessary for 500,000 accesses (including the page fault), which was calculated earlier, is used as a unit to determine the maximum frequency of occurrence in one second. Thus, the maximum number of the page faults per second becomes $1 \div (2 \times 10^{-1}) = 5$ (times/second), which means that c) is the correct answer.

Question 9

Q9. (q2-53) Which of the following is an appropriate explanation of API (Application Program Interface) in an OS?

- a. It is a mechanism by which an application directly operates hardware to achieve various functions.
- b. It is a mechanism by which various functions provided by the OS are used from an application.
- c. It is a mechanism by which communication is performed between multiple applications across a network.
- d. It is a mechanism by which the menu items of each application are standardized for the convenience of the users.

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Question 9: Answer Explanation

- API (Application Program Interface) is a mechanism for using various functions of the OS from application software, and is a collective term for interfaces, such as the functions, commands, and utilities provided for easy development of a program. Therefore, the description b) is appropriate.

- a) This is an explanation of a mechanism that is used to operate the hardware directly from an application without using APIs (such as Windows DirectX), in order to improve the speed of image rendering.

- c) The mechanism of communication between multiple applications across a network includes a socket, which is a TCP/IP-based communication interface between processes.

- d) This is an explanation concerning the integration of GUIs (Graphical User Interfaces), which includes Motif and OPEN LOOK of UNIX.

Question 10

Q10. (q2-54) Which of the following is an appropriate explanation of middleware?

a. Software that provides basic functions for using the CPU, memory, and I/O devices from the application software

b. Software that uses the functions of an OS to provide higher-level basic functions common to various application fields

c. Software that manages business resources in an integrated way and helps achieve efficient business, from the perspective of using business resources effectively

d. Software that has functions, such as communication via e-mail and electronic bulletin boards, data sharing, and centralized schedule management, to support collaborative work

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- Middleware refers to software that functions in an intermediate position between the operating system and application software and provides generalized versions of functions that are commonly used by the application software. It also performs the role of effectively linking the application software and the operating system.
  Therefore, b) is the appropriate explanation.

- a) This is an explanation of the operating system. It manages various resources such as the hardware and data, and ensures their effective use. Besides control programs in a narrow definition of an OS, language processors and service programs are also included.

- c) This is an explanation of an ERP (Enterprise Resource Planning) package. An ERP package is a business package that integrates the mission-critical business systems of a company. It can support wide-spread activities from the procurement of raw material to production, sales, and personnel affairs.

- d) This is an explanation of groupware. Groupware is software that supports a mechanism for collaborative work by a group. It has functions for sharing document information, providing communication tools (such as e-mail and electronic bulletin board), and managing workflow. Q2-56d)

Question 11

Q11. (q2-56) Among the descriptions concerning the storage of a file, which of the following is an appropriate explanation of an archive?

a. The specific data of main memory or the value of a register is temporarily stored in another storage device.

b. Two hard disks store identical files in order to secure the reliability of data storage.

c. The update history of a file is stored on a hard disk.

d. Multiple files are bundled and stored as a single file in a storage device.

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Question 11: Answer Explanation

- In English, archive means a record, storage, or old document. In computer terminology, archive means to compile multiple files into a single file, and store this on a storage device, as described in d). In many cases, in order to effectively use the storage media, or improve the efficiency of backup and distribution, the data is compressed. A file compiled as an archive is sometimes called a stack.

- a) This is an explanation of "data save".

- b) This is an explanation of file mirroring.

- c) This is an explanation of the update log of the database.

Question 12

Q12. (q2-57) Which of the following is an appropriate explanation of various types of language processors?

a. An assembler converts a source program that is written for a particular processor into a source program for another processor.

b. An interpreter is a microprogram that decodes and executes a program written for another computer.

c. A generator creates a program as appropriate for the purpose of processing by specifying the necessary conditions, such as input, process, and output, as parameters.

d. A translator executes a program written in a high-level language while interpreting it on a per line basis.

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Question 13

Q13. (q2-58) Which of the following is an appropriate explanation of optimization in a compiler?

a. Generating an intermediate code for an interpreter, instead of creating an object code

b. Generating an object code which runs on a computer whose architecture is different from the computer which performs compilation

c. Generating an object code with improved run-time processing efficiency by analyzing the program code

d. Generating an object code is generated which displays the invoked routine name and the content of a variable at a particular point in time during the execution of a program

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Question 13: Answer Explanation

- Optimization of a compiler implies changing a program so as to reduce the execution time and size of the object program without changing the functions of the program.
  Therefore, c) is appropriate.
  For example, deletion of redundant instructions, and reorganization of loops and register assignment are performed. Optimization is mostly performed after semantic analysis within the flow of a series of compilation processes. (Lexical analysis → Syntax analysis → Semantic analysis → Code optimization → Code generation)
- a) This is a description concerning an interpreter. An interpreter executes a program while translating it, and therefore, it does not generate an object code.
- b) This is a description concerning a cross compiler.
- d) This is a description concerning a function called snapshot dump that is used for debugging. If the debug mode is set as an option for compilation, most compilers usually generate such object code.

Question 14

Q14. (q2-59) Which of the following is an appropriate explanation of the functions of a programming tool?

a. An inspector displays the content of data during the execution of a program.

b. A simulator displays the execution path within a program or between programs.

c. A tracer makes it easier to search for functional explanations and data definitions in each program.

d. A browser edits the source code of a program by using functions such as character insertion, deletion, and substitution.

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Theme: Software, Category: FE

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Question 15

Q15. (q2-61) Which of the following is an appropriate explanation in accordance with the definition of open source software provided by OSI?

a. When open source software is created for a particular industry, the source code can be released only within that industry.

b. When open source software is modified and redistributed, the same license must be applied so that the distribution conditions are the same as the original software.

c. When open source software is redistributed as a product by a third party, the developer of the open source software can ask the third party for a licensing fee.

d. When open source software is modified, such as for in-house use but not for redistribution, the modified source code need not be released to the public.

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Question 16

Q16. (2021 A FE AM-q17) In Round Robin scheduling, the CPU-time is shared among processes on the basis of the predefined time slot. There are four processes, namely P1, P2, P3, and P4, and their corresponding CPU-execution times are shown in the table below. All four (4) processes arrive at time 0, in the given order, and waiting time is the total time for which a process has to wait before it obtains its time slice for execution. Each time slot is 10 milliseconds. Which of the following is the average waiting time in milliseconds for the processes to be executed in Round Robin?

Process	CPU-execution time
P1	10
P2	23
P3	7
P4	3

a. 10.75

b. 14.25

c. 15.00

d. 16.75

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Question 17

Q17. (2021 A FE AM-q18) There exist methods to obtain backup files for the purpose of recovering files and managing generations. Which of the following is an appropriate description for those methods or procedures?

a. A differential backup contains all files that are modified following the last full backup, while an incremental backup saves all files that are modified after the last full, differential, or incremental backup.

b. A differential backup may take longer to restore files than an incremental backup, because the most recent versions of files are spread across a larger number of backup sets.

c. A multiplexed backup is used as a mixed combination of a full backup, differential backup, and incremental backup.

d. An incremental backup tends to take longer to backup files than a differential backup because more files are copied during each backup.

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Question 18

Q18. (2021 A FE AM-q19) A processor takes 15 seconds to run an application compiled with an old compiler. A new compiler was released. The same application compiled with the new compiler executes fewer instructions by 40%, but the average clock cycles per instruction (CPI) is increased by 10%. How many seconds does it take for the same processor to run the same application compiled with the new compiler?

- a. 4.125
- b. 6.6
- c. 9.09
- d. 9.9

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Question 19

Q19. (2021 S FE AM-q18) Among the page replacement methods in virtual memory management, which of the following is the LRU control method?

- **a.** Each page is managed by appending a reference flag and a change flag, and pages without reference or change are replaced with higher priority.
- **b.** One of the pages in main memory is randomly chosen with the same probability and then replaced.
- **c.** The page that has been stored in the main memory for the longest time is replaced.
- **d.** The page that has not been referenced the longest time is replaced.

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Question 20

Q20. (2021 S FE AM-q19) Which of the following is an appropriate function of a linker?

a. To load a load module to the main memory ahead of execution

b. To monitor the execution of a program and to record the execution results for each step

c. To perform a resolution of cross references and to create one (1) load module from multiple object modules

d. To register a created program in a library

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Any Questions?

References

📄 IT Fundamentals (New FE Textbook Vol. 1)