Topics	Sub-topics	Notes		Comments
				Explain the functions of keyboard
		.Magnetic ink character reader	Ⓜ	Explain the functions of magnetic ink character reader
				Explain the font type of magnetic ink reader
		.Optical character reader	Ⓞ	Explain the functions of OCR
				Explain the font type of OCR characters
		.Graphic terminal	Ⓓ	Explain the functions of graphic display unit and CAD terminal
		.Plotter	Ⓖ	Explain the functions of X-Y plotter
		.Speech recognizer	Ⓢ	Explain the functions of speech recognizer
		.Optical bar-code reader	Ⓒ	Explain the functions of optical bar-code reader
		.Other terminals	Ⓧ	Explain the outline of following terminals

Topics	Sub-topics	Notes		Comments
				POS terminal Image terminal (Image printer and Image reader) CAD terminal ID card reader IC card
		.Pointing devices	○	Explain the functions of following devices Light pen Touch screen Control ball Mouse Joy stick
	5.3[2.0] Online devices	.Outline of online system	◎	Explain the outline of online system from H/W point of view

12

Subject: HARDWARE

4 - 5 - 2 .1

Topics	Sub-topics	Notes	Comments
		.Communication control unit (CCU)	Explain the basic functions of CCU
		.Modulator Demodulator(MODEM)	Explain the basic functions of MODEM
		.Exercise	

13

SUB.

NO.	DATE	PAGE	REVISED POINT	RMK
	dd mm yy	sec. top. sub.		

Diploma in Computer Technology

Subject	Title	HARDWARE RESOURCES 2.7				
	Responsible	Expert	S.TAKAHASHI			
		C/P				
Aim	Understanding the system architecture , hardware architecture and computer technology concerning the general purpose computer.					
Teaching Strategy	Lecture	Tutorial	Exercise	Practical	Total	
	40	-	-	-	40	
Preceding Subjecect	Hardware Software					
Succeding Subject	Project exercise					
Objective	Upon the successful completion of this subject , students should be able to : (1) Understand the concept of hardware architecture. (2) Explain the detail functions of hardware architeture. (3) Explain the fole and micro technigues of integrated circuit.					
Contents	1. Computer Architecture 2. Processor Architecture 3. Input/Output Architecture 4. Technology					
Remarks	NONE					
Mode of Assesment	Written test	60 %				
	Practical test					
	Assignment	40 %				
	Report					
	Oral			Date : 30 /3/ 1988 (REV 003)		
		100 %		By : S. Takahashi		

Institute of computer technology

Topics	Sub-topics	Notes		Comments
1. Computer Architecture	1.1 [2] Introduction of computer architecture	.What is a computer Architecture	◎	Describe the computer architecture into following three items System Architecture Hardware Architecture Technology
		.System Architecture (OS)	○	Describe the system architecture into following items. Virtual storage(VS) Storage protection Virtual Machine(VM)
		.Hardware architecture	◎	Describe the hardware architecture into following two items Processor Architecture Input/Output Architecture
		.Technology	◎	Describe the technology into following three items Circuit technology Circuit configuration Program module organization
		.Structure of computer architecture	○	Explain the structure by using simple chart
	1.2[0.5] History of computer architecture	.History of computer architecture	◎	Explain the computer architecture by using addressing method 1950 -- Index addressing Indirect addressing 1960 -- Interruption

Topics	Sub-topics	Notes	Comments
			Multiprogramming Base register Page addressing 1970 -- Virtual memory management 1980 -- Extended Address area (36 -- 41 bit)

Topics	Sub-topics	Notes	Comments
2. Processor Architecture	2.1 [8] CPU Architecture	.Instruction set and instruction format	Explain the computer instruction set and format by using two addressing method Why present computers using two addressing method
		.Usage of register	Explain the usage of processing method of register by using general purpose register Explain the advantage and disadvantage of register Explain the new register architecture by using following keywords Stack structure Register window
		.Addressing Assignment	Explain the basic address assignment method by using following keywords Header Address Relative address method Absolute address method
		.Addressing method	Operand address modification method Explain the address modification method by using following three method Indexing modification Indirect modification Relative modification
		.Paging	Explain the outline of paging function Logical address

Topics	Sub-topics	Notes		Comments
				Physical address Locality Page fault
		.Segmented system	Δ	Explain the outline of segmented system Main routine Sub routine
		.Memory protection	◎	Explain the outline of memory protection Describe the memory protection method into following five items Limit method Mode control method Key method Access right control method Ring protection method Explain the ring protection method by using S430 memory protection method
		.Memory structure	◎	Describe the memory structure as follow: Register Buffer storage Main memory Disk cache Aux. storage Back up storage
		.Buffer storage (Cache memory)	○	Explain the functions of buffer storage by using following keywords Hit ratio Access time Describe the cache memory mapping method

Topics	Sub-topics	Notes	Comments
			Full associated Sector Set associated Explained buffering Last recently used (LRU)
	2.2 [3] High speed processor architecture	.prefetch control	Describe the prefetch control into following items Prefetch of insruction Modifications method
			Explain the outline of prefetch of inst. by using following keywords Overlap execution JUMP instructions
		.Memory interlacing (Memory interleaving)	Explain the outline of memory interleaving functions
		.Parallel processing	Explain the outline of parallel processong
		.Pipeline control	Explain the outline of pipeline control by using following example Floating point add Sifting Add Normalization of floating point number
			Explain the vector calculation by using following example DO 100 I=1,N C(I)=A(I)+B(I)

Topics	Sub-topics	Notes	Comments
			100 CONTINUE ↑ Load ,R,B(i) Add,R,A(i) Store,R,C(i) Increment,RI Compare and Branch,RI,N
	2.3 [6] Microprogram	.What is a microprograms	Explain the outline of microprograms Explain the advantage and disadvantage of microprogram
		.How microprograms runs on computer	Explain the micro program process by using ADD calculation
		.Micro instructions	Describe the micro instructions into following two items Vertical micro inst. Horizontal micro inst.
		.Vertical micro instruction	Explain the outline of vertical micro inst. by using following keywords Pico program Nano program
		.Horizontal micro instruction	Explain the horizontal micro inst. by using following keywords CODE method BIT steering Explain the advantage and disadvantage of code method Explain the advantage and disadvantage of BIT steering

Topics	Sub-topics	Notes	Comments
		.Efficient of microprogram	Explain the effect of microprogram by using following comparison FORTRAN IV | Machine language | Micro program
		.Firmware	What is the firmware Explain the F/W by using microprogram Operating system based on F/W Explain the advantage of firmwarezation by using following comparison Software - F/W Insert into queue Delete from queue Wait process Signal process
		.Emulator	Explain the outline of emulator by using following keywords Stand-alone emulator General emulator
		.Micro diagnostic program	Functions of micro diagnostic programs Explain the type of micro diagnostic program based on S430 computer Memory micro diagnostic IOP ICP etc
		.Future of microprograms	Explain the future of microprograms

Topics	Sub-topics	Notes	✓	Comments
3. Input/ Output Architecture	3.1 [2] Outline of I/O interface	.Characteristic of input/output devices	◎	Explain the char. of I/O devices (From processing speed point of view)
		.Input/Output interface	◎	Describe the I/O interface into following three items Direct control method Direct memory access (DMA) Channel method (I/O processor)
		.Direct control method	□	Explain the functions of direct control method by using following keywords One word transmission CPU usage
		.Direct memory access	□	Explain the functions of DMA by using following keywords Memory cycle steal Data under run Data over run Interruption
	3.2 [4] Channel I/O processor	.Outline of I/O channel	◎	Describe the functions of I/O channel into following seven items Data transmission between MM and channel Buffering of I/O data Decoding of channel commands

Topics	Sub-topics	Notes	Comments
			Data transmission between I/O device and channel
			Initiation and termination of I/O devices
			Program interruption
			Checking the status of I/O devices
		.Disk cache	◎ Explain the functions of disk cache by using following keywords
			Hit ratio Read time Write time

Topics	Sub-topics	Notes	✓	Comments
		.Channel program	◎	Explain the structure of channel command Type of channel command READ WRITE CONTROL SENSE TRANSFER IN CHANNEL (TIC) etc Explain the channel program by using following example Write the data in disk unit SEEK SEARCH TIC WRITE
		.Type of channel	◎	Channel type: Selector channel Byte multiplexer channel Block multiplexer channel Explain the functions of the above channels Explain the advantage and disadvantage of each channels Selector channel Byte multiplexer channel Block multiplexer channel

Topics	Sub-topics	Notes	Comments
4. Technology	4.1 [3] Semiconductor	.Outline of semiconductor	Explain the outline of semiconductor by using following keywords n type semiconductor p type semiconductor Describe the semiconductor into following two items Bipolar transistor MOSFET Explain the difference of bipolar transistor and MOSFET by using following keywords Level of voltage
		.Basic logic elements	Describe the basic logic elements ECL TTL nMOS CMOS Explain the characteristic of above elements by using following keywords Speed Integration Electric power
		.Semiconductor memory	type: ROM (Read only memory) RAM (Random access memory) Explain the ROM & RAM by using following example Black board and documents

Topics	Sub-topics	Notes	☑	Comments
				Describe the RAM into following two items DRAM SRAM Explain the difference between DRAM and SRAM by using following keywords Refresh control Integration Speed Explain the outline of PROM and NROM
		.New memory device	☐	HEMT device (High Electron Mobility Transistor) GaAs device JJ device (Josephson Junction) Explain the outline of new memory devices
	4.2[5] Integrated Circuit (IC LSI VLSI)	.History of IC	☐	1960 -- SSI (Small Scale Integration) 1965 -- MSI (Medium Scale Integration) 1970 -- LSI (Large Scale Integration) 1980 -- VLSI (Very Large Scale Integration)
		.LSI Memory	☐	Explain the LSI memory by using S430 LSI *memory*
		.RAM	☐	Explain the history and functions of DRAM

Topics	Sub-topics	Notes	Comments
			PMOS (1 Kbit) Explain the functions of PMOS memory by using NMOS circuit
			NMOS memory (4 Kbit) Explain the NMOS memory by using NMOS circuit
			DRAM (16 Kbit) Explain the 16k DRAM by using two dinensionul address method
			DRAM (64 Kbit) Explain the 64k DRAM by using memory array techniques
			Explain the history and characteristic of SRAM
		.ROM	Explain the functions of mask POM
			Explain the PROM cell structures
			Fuse type Diode short method type
			EPROM Explain the EPROM functions by using FAMOS memory Array structure
			EAROM Explain the EAROM functions and structure by using NMOS and FLOTOX structure

Topics	Sub-topics	Notes	Comments
		.CCD memory	Explain the outline of CCD memory by using following keywords Synchronous method Serial-parallel-serial Leathery time
		.Magnetic bubble memory	Explain the outline of magnetic bubble memory by using following keywords Bubble Sift register method Major minor loop method
		.LSI Integrations and micro techniques	Explain the outline of LSI integration and micro techniques Explain the relation between year and NO. of devices per chip Explain the problems of yield Explain the relation between No. of gate and No. of pins per chip
	4.3 [5] RAS (Reliability Availability Serviceability) Explain the RAS concept from H/W point of view	.Outline of RAS	Explain the basic concept of RAS by using following keywords MTBF (Mean Time Between Failure) Availability (MTBF/MTBF + MTTR) MTTR (Mean Time To Repair)

Topics	Sub-topics	Notes	Comments
		.System configuration	Describe the system configurations as follow:
			Simplex system
			Dual system
			Duplex system
			Load share system
			Tandem system
			Multi processor system
			Explain the characteristic of above system
		.System reliability	Explain the definition of system reliability by using following examples
			Serial system
			Parallel system
			Calculate the system reliability
		.Error detection techniques	ECC Error Correction Code
			Explain the basic techniques of ECC by using simple example
			Hamming code
			CRC (Cyclic redundancy Code)
			Explain the basic techniques of CRC by using simple example
			Microdiagnostics
			Explain the functions of microdiagnostics
			Service processor
			Explain the functions of service processor

Topics	Sub-topics	Notes	Comments
	4.4 [1] Future of computer H/W.	.New devices	GaAs device HEMT device JJ device Future of new devices 1990: 4 to 32 Mbit chip
		.Computer system	New type of WS (Work station) 1 to 3 MIPS Host computer 100 MIPS MM 1GB Data base machine AI machine LISP machine PROLOG machine New network system ISDN (Integrated Services Digital Network)

SUB.   SUB.

NO.	DATE dd. mm. yy.	PAGE ser. top. sub.	REVISED POINT	RMK

Subject	Title :2.3 SOFTWARE				
	Responsible	Expert	Yoshio Niizeki		
		C/P	S.A.U.Gunasekara, J.Karunanayake		
Aim	To provide the role and system of the software, programming language, language and language processor and operating system as basic knowledge.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	40	0	0		40
Preceding subjects	1.Orientation 2.Information Processing and Computers				
Succeeding subjects	1. SOFTWARE RESOURCE				
Objective	Upon the successful completion of this subject, Students should be able to: (i) Explain the general items concerning with the software including operating system.				
Contents	1.Introduction 2.Systems of the software 3.Programming system 4.Operating system 5.Utilities 6.Programming languages 7.Application packages				
Remarks	None				
Mode of Assessment	Written test	40			
	Practical test	0			
	Assignment	20			
	Report	20			
	Oral	0		Date :9.Dec. 87	
				By :Y.Niizeki	

Subject : SOFTWARE

1 – 1 –23

Topics	Sub-topics	Notes	L	Comments
1. Introduction	1.1[1] What is software?	· Relationship between software and hardware	⊖	Explain the relationship between software and hardware and give the definition of software.
		· Firmware	◎	Explain the firmware

Subject : SOFTWARE

1 – 2 –2.3

Topics	Sub-topics	Notes	L	Comments
2. Systems of the software	2.1 [1.5] System software	· Programs to control hardware	○	Explain the system software on the point of view of their purposes.
		· Programs to process data	○	
		· Programs to help write programs	○	
		· Programs to help run programs	○	
		· Utility software	○	
	1.8 2.2 [~~1.5~~] Application of software	· Management science	△	A brief description of application packages. A detailed description will be made in another subject.
		· Engineering	△	
		· Informating retrieval	△	
		· CAE	△	
		· Production management	△	

Subject : SOFTWARE

1 - 3 - 23

Topics	Sub-topics	Notes	L.	Comments
3. Programming languages system	3.1 [0.5] History of programming languages		○	Explain a brief history of programming languages. The detailed history of each languages will be described latter.
	3.2 [~~1.0~~ 1.5] Types of language processor	· Assembler	◎	A brief description of different types of language processors.
		· Compiler*	◎	
		· Interpreter	◎	
		· Others (Generator, translator) Pre-compiler etc	◎	*… Explain "the reverse Polish notation" as a technique in compiler.
	3.3 [1.5] Types of programming languages	· machine-oriented language	◎	A brief description and the usage of each programming languages.
		· problem-oriented language	◎	
		· procedure-oriented language	◎	
		· others (non procedure-oriented language; special problem-oriented language)	◎	

Subject : SOFTWARE 1 – 4 – 23

Topics	Sub-topics	Notes	L	Comments
4. Programming languages				A brief description about the histories, main usages, characteristics, and examples of each programming languages.
	4.1 [1.0] FORTRAN	· History · Characteristic · Function · Example	○	Scientific usage
	4.2 [1.0] COBOL		○	Business usage
	4.3 [1.0] PL/I		○	Developed by IBM
	4.4 [1.0] ALGOL		○	Algorithm oriented programming languag.
	4.5 [1.0] PASCAL		○	Structured programming
	4.6 [1.0] BASIC		○	Conversational language
	4.7 [1.0] RPG		○	Report generator
	4.8 [1.0] C		○	
	4.9 [1.0] ASSEMBLER		○	
	4.10 [1.0] OTHERS		○	e.g. APL, ADA, LISP, LOGO, PROLOG, GPSS etc.

Subject : SOFTWARE

1 - 5 - 23

Topics	Sub-topics	Notes	L	Comments
5. Operating system				A brief description of an Operating system as a basic knowledge of a computer. A detailed description will be described in "SOFTWARE RESOURCE".
	5.1 [1.5] What is an Operating system?	• Aim and necessity	◎	
		• Basic structure	◎	
		• History	◎	
	5.2 [1.5] Types of Operating systems.	• Job-by-job processing	○	
		• Early batch processing	○	
		• Executive system	○	
		• Multiprogramming	○	
		• On-line system	○	
		• Time-sharing system	○	
		• Multiprocessing	○	

Subject : SOFTWARE

2-5 -2.3

Topics	Sub-topics	Notes	L	Comments
	5.3 [2.0] Components of an Operating System	· Control programs (Monitor, EXEC)	◎	Their main functions are · Job management · Data management · Task management · Memory management · Network management · Diagnostics/Recovery
		· Processing programs	○	· Language · Service programs · User programs
	5.4 [2.0] Interrupt	· Program Status Word Register	◎	Explain the relationship between CPU and Operating system.
		· Interrupt factors	◎	Explain the following types of interrupts. · Hardware · External · Supervisor call · Program · I/O
		· Interrupt mechanism	◎	Explain the method briefly how to control interrupts.

Subject : SOFTWARE

3 – 5 –23

Topics	Sub-topics	Notes	L	Comments
	5.5[2.0] Job Management	· Job concept	◎	By introducing the several basic JCL statements, explain the procedure from input through output. Also explain the following terms. Input stream, Scheduler Spooling...
		· Introduction of JCL	◎	
		· Job input	◎	
		· Job scheduling	◎	
		· Job execution	◎	
		· Job output	◎	
	5.6[2.0] Task Management	· Concept of a task (process)	◎	By introducing the concept of task, explain the inner processing of Computer. As an example of task management discuss the multi-processing (ie. multi-programming and multi-task-processing) Refer to the concept of sharing and deadlock.
		· Interrupt processing	◎	
		· CPU dispatching	◎	
		· Synchronization	◎	
		· Multiprocessing	◎	
		├ Multiprogramming		
		└ Multi-task-processing		

Subject : SOFTWARE

4 – 5 – 2.3

Topics	Sub-topics	Notes	L	Comments
	5.7[2.0] Memory Management			
		· Single	◎	Discuss the basic method of memory assignment. Also explain the basic control method of virtual memory system.
		· Partition	◎	
		· Relocation	◎	
		· Virtual memory	◎	
	5.8[2.0] Data Management			
		· Basic sequential access method	◎	Discuss the basic control method of data management including the buffer control method as the following. · Simple buffering · Exchange buffering · Segment chaining buffering · Dynamic buffering
		· Buffer area control	◎	
		· Physical and logical file organization	◎	
		· Catalog management	◎	
		· File sharing and protection	◎	
		· Device management	◎	

Subject : SOFTWARE

1 - 6 - 2.3

Topics	Sub-topics	Notes	L	Comments
6. Utilities	6.1 [1.0] Outline		○	Explain the kinds and charateristics of utilities briefly.
	6.2 [1.0] Loader	· IPL (Bootstrap)	○	
		· Absolute loader	○	
		· Relocatable loader	○	
	6.3 [1.0] Linkage Editor	· Object module	○	
		· Load module	○	
		· Linkage	○	
	6.4 [1.0] Debugging Aid			Explain the kinds of debugging aid and their characteristics
		· Editor	○	
		· Dump Routine	○	
		· Test Support Tools	○	
		· Tracer	○	

Subject : SOFTWARE 2-6 -23

Topics	Sub-topics	Notes	L	Comments
	6.5[1.0] Library Maintenance programs	• What is a library?	◎	
		• Types of libraries.	◎	Explain the following types of libraries. • Source library • Compiled unit library • Load module library • Integrated library
		• Functions of library maintenance programs	○	
	6.6[1.0] Sort/Merg programs	• Functions	◎	
		• Characteristics	○	
		• Examples	○	
	6.7[1.0] File Maintenance programs	• Functions	◎	
		• Characteristics	○	
		• Examples	○	
	6.8[1.0] Others	• Media convert program	○	

Subject	Title 12.4 SOFTWARE RESOURCE				
	Responsible	Expert	Yoshio Niizeki		
		C/P	A.N.Ranasinghe,K. Weerawarna		
Aim	To provide the mechanism, configuration and utilization of a typical operating system. Also provide the basic knowledge to understand some kind of system program.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	40	0	0		40
Preceding subjects	1.SOFTWARE 2.HARDWARE				
Succeeding subjects					
Objective	Upon the successful completion of this subject, Students should be able to: (1) Explain the characteristics of three typical operating systems. (2) Understand the same special functions supported by system programs.				
Contents	1.Multiple Virtual Storage Operating system 2.UNIX Operating system 3.System Programming 4.Others				
Remarks	None				
Mode of Assessment	Written test	40			
	Practical test	0			
	Assignment	40			
	Report	20			
	Oral	0		Date :9.Dec. 87	
				By :Y.Niizeki	

Subject : SOFTWARE RESOURCE

1 — 1 —2.4

Topics	Sub-topics	Notes	L	Comments
1. Multiple Virtual Storage Operating System	1.1 [2] Outline	• History of Virtual Storage Operating System	○	Brief description of the historical background about the appearance of Multi Virtual Storage Operating System.
		• Characteristics of Multiple Virtual Storage Operating System	◎	Describe the main advantages of Multi Virtual Storage O/P.
		• Configuration and functions	△	Brief description of the configuration and functions.
	1.2 [3] Job management			
		• Configuration and functions	△	
		• Batch Job Processing	○	Describe the process from Input to Output.
		• Time Sharing Processing	○	Describe the characteristics of Time Sharing Processing.
	1.3 [3] Task management	• Concept of Job/Task	○	Provide the definition of job/task.
		• Interruption and dispatching	○	Provide the definition of interruption and discuss the dispatching mechanism.

Subject : SOFTWARE RESOURCE

2 – 1 – 2.4

Topics	Sub-topics	Notes	L	Comments
	1.4[3] Memory management	• Introduction of Virtual Storage System	○	Discuss the basic mechanism of Virtual Storage System.
		• Extention to Multi Virtual Storage management	◎	Using the above knowledge discuss the basic mechanism of Multi Virtual Storage System.
	1.5[3] Data management	• Outline of I/O processing	○	
		• JCL statements for I/O processing	○	Describe the examples of JCL statements for handling files.
	1.6[3] RAS	• What is RAS?	△	Describe the meaning of RAS.
		• Hardware recovery	○	Describe the mechanism of the hardware recovery.
		• Software recovery	○	Describe the mechanism of the software recovery.

Subject : SOFTWARE RESOURCE 3 − 1 − 2.4

Topics	Sub-topics	Notes	L	Comments
	1.7 [2] System Installation	• What is System Installation?	○	Describe the meaning and necessity of system installation.
		• Preparation for System Installation	△	Briefly describe the parameters for system installation.
		• System Installation Tasks	△	Describe the system installation procedure.
		• System Operation	○	Describe the basic operations for running the system.
	1.8 [1] Others	• System Resource Manager	○	Describe the SRM as another important function of MDS.

Subject : SOFTWARE RESOURCE 1 - 2 -2.4

Topics	Sub-topics	Notes	L	Comments
2. UNIX Operating System	2.1 [1] Introduction	• History	○	Describe the main versions released by AT&T and Berkeley.
		• Characteristics	◎	Discuss the followings: ① File system ② Basic commands ③ Documentation ④ Communication method ⑤ Operations
		• Basic configuration	○	Provide the basic knowledge which is useful to understand the following discussion.
	2.2 [1] Connection/Disconnection to the System	• Log-in/Log-out	◎	Discribe the basic procedure how to connect/ disconnect to UNIX system by using the following words and briefly discribe the format of UNIX commands.
		• Commands	○	
		• Terminal Attributes	△	
		• Documentation	△	logging in/on, logging off/out sign on/off, command prompt password, control character line kill character man-command
	2.3 [2] File System	• Characteristics	◎	Discribe the file system by using the following words. tree structure, directory, working dir, home dir, & root dir. path, owner, protection naming rule, access mode...
		• Utility Commands	○	Introduce some useful commands to handle files. ls, cd, cat, tail, cp, mv rm, mkdir, rmdir, ls-l, chmod...
		• Inner Structure	△	Briefly describe the following concepts: block, boot area, super block, i-list, i-node, indirect block.

Subject : SOFTWARE RESOURCE 2 - 2 - 2.4

Topics	Sub-topics	Notes	L	Comments
	2.4[2] Shell	• Concept of Shell	◎	Introduce the concept of shell and standard file.
		• Basic usage	◎	Provide an explanation of redirection
		• Advanced usage	△	Briefly describe the shell command language and shell variable.
	2.5[2] Process	• Concept of Process	◎	Introduce the concept of process.
		• Interprocess communication	○	Describe how to make an interprocess communication.
		• Control of Process	○	Describe how to control the execution of process.
		• Concept of Filter	○	Introduce the concept of filter and give examples.
	2.6[3] Editor	• Line Editor -ed, ex-	◎	Describe the followings: ① Characteristics ② Main functions ③ Useful commands
		• Screen Editor -vi-	◎	
	2.7[1] Documentation	• Outline	◎	Describe the standard procedure to make documents.
		• Nroff command	○	Provide the main functions and examples of usage.
		• Utility	○	Describe the following document utilities briefly: ① Document macro package ② Column-utility ③ Table layout utility

Subject : SOFWARE RESOURCE 3 – 2 – 24

Topics	Sub-topics	Notes	L	Comments
	2.8[2] Basic Commands	• Process Control Commands for user	○	List up some basic commands of each categories and give simple examples.
		• Communication Commands	○	(1) ps, sh, wait, kill, nice, at ...
		• File Handling Commands	○	(2) echo, write, who, msg, mail, wall, xsend, xget enroll, calendar ...
		• Others	△	(3) cmp, crypt, diff, file, find, join, pack, pcat, unpack, rev, sort, grep ...
				(4) uucp, [uux], uulog, uuclean, uustat, uusub, uuto, uupick, cu, stty
	2.9[1] Installation and Operation	• Installation	○	List up the procedures for system installation and describe each procedure briefly.
		• Operation	○	Describe the daily operation and functions for system maintenance.

Subject : SOFTWARE RESOURCE 1 — 3 — 2.4

Topics	Sub-topics	Notes	L	Comments
3. System Programming	3.1 [1] Introduction	• Necessity and purpose	◎	
		• Kinds of System programming	○	Give several examples of system programming.
	3.2 [1] System Macros	• Concept of System Macros	◎	Introduce system macros as routines which give smooth-shaped services to programms.
		• System Control Macros	○	Briefly describe the characteristics and list up several macros.
		• Data Control Macros	○	
		• Message Control Macros	○	
		• System Service Macros	○	
	3.3 [1] Others	• Concept of Semaphore	◎	Introduce the concept of Semaphore as a communication method between tasks.
		• Linkage Parameters for Task control	◎	Briefly describe the main parameters to link multi task program

Subject : SOFTWARE RESOURCE

1 - 4. - 2.4

Topics	Sub-topics	Notes	L	Comments
4. Others	4.1 [2] Virtual Machine	• What is a Virtual Machine?	◎	
		• Configuration and functions.	○	

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Diploma in Computer Technology 3.4

Subject	Title	2.4 SOFWARE RESOURCES			
	Responsible	Expert	Yoshio Nitzeki		
		C/P	Kamal, Ranasinghe		
Aim	To provide the mechanism, configuration, and utilization of a typical operating system. Also provide the basic knowledge to understand some kind of system program.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	40	0	0		40
Preceding Subjecect	1. SOFTWARE 2. HARDWARE				
Succeding Subject	-				
Objective	Upon the successful completion of this subject, students should be able to: (1) Explain the characteristics of three typical Operating systems. (2) Understand the some special functions supported by system programs.				
Contents	1. Multiple Virtual Storage Operating System 2. UNIX Operating System 3. System Programming 4. Others				
Remarks	NONE				
Mode of Assesment	Written test	40			
	Practical test	0			
	Assignment	40			
	Report	20			
	Oral	0		Date : 9. DEC., '82	
				By : Y. Nitzeki	

Institute of computer technology

Subject : SOFTWARE RESOURCE

1 — 1 — 2.4

Topics	Sub-topics	Notes	L	Comments
1. Multiple Virtual Storage Operating System	1.1 [2] Outline	• History of Virtual Storage Operating System	○	Brief description of the historical background about the appearance of Multi Virtual Storage Operating System.
		• Characteristics of Multiple Virtual Storage Operating System	◎	Describe the main advantages of Multi Virtual Storage O/p.
		• Configuration and functions	△	Brief description of the configuration and functions.
	1.2 [3] Job management			
		• Configuration and functions	△	
		• Batch Job Processing	○	Describe the process from Input to Output.
		• Time Sharing Processing	○	Describe the characteristic of Time Sharing Processing.
	1.3 [3] Task management	• Concept of Job/Task	○	Provide the definition of job/task.
		• Interruption and dispatching	○	Provide the definition of interruption and discuss the dispatching mechanism.

Subject : SOFTWARE RESOURCE

2 — 1 — 2.4

Topics	Sub-topics	Notes	L	Comments
	1.4[3] Memory management	• Introduction of Virtual Storage System	○	Discuss the basic mechanism of Virtual Storage System.
		• Extention to Multi Virtual Storage management	◎	Using the above knowledge discuss the basic mechanism of Multi Virtual Storage System.
	1.5[3] Data management	• Outline of I/O processing	○	
		• JCL statements for I/O processing	○	Describe the examples of JCL statements for handling files.
	1.6[3] RAS	• What is RAS?	△	Describe the meaning of RAS.
		• Hardware recovery	○	Describe the mechanism of the hardware recovery
		• Software recovery	○	Describe the mechanism of the software recovery

Subject : SOFTWARE RESOURCE 3 — 1 — 2.4

Topics	Sub-topics	Notes	L	Comments
	1.7[3] System Installation	• What is System Installation?	○	Describe the meaning and necessity of system installation.
		• Preparation for System Installation	△	Briefly describe the parameters for system installation.
		• System Installation Tasks	△	Describe the system installation procedure.
		• System Operation	○	Describe the basic operations for running the system.

Subject : SOFTWARE RESOURCE

1 – 2 – 2.1

Topics	Sub-topics	Notes	L	Comments
2. UNIX Operating System	2.1 [1] Introduction	• History	○	Describe the main versions released by AT&T and Berkeley.
		• Characteristics	◎	Dicuss the following: ① File system ② Basic commands ③ Documentation ④ Communication method ⑤ Operations
		• Basic configuration	○	Provide the basic knowledge which is useful to understand the following discussion.
	2.2 [1] Connection/Disconnection to the System	• Log-in/Log-out	◎	Discribe the basic procedure how to connect/ disconnect to UNIX system by using the following words and briefly discribe the format of UNIX commands. logging in/on, logging off/out sign on/off, command prompt password, control character line kill character man-command
		• Commands	○	
		• Terminal Attributes	△	
		• Documentation	△	
	2.3 [2] File System	• Characteristics	◎	Discribe the file system by using the following words. tree structure, directory, working dir, home dir & root dir. path, owner, protection naming rule, access mode
		• Utility Commands	○	Introduce some useful commands to handle files. ls, cd, cat, tail, cp, mv rm, mkdir, rmdir, lc-l, chmod...
		• Inner Structure	△	Briefly describe the following concepts: block, boot area, super block, inlist, i-node, indirect block

Subject : SOFTWARE RESOURCE 2 – 2 – 24

Topics	Sub-topics	Notes	L	Comments
	2.4[2] Shell	• Concept of Shell	◎	Introduce the concept of shell and standard file.
		• Basic usage	◎	Provide an explanation of redirection
		• Advanced usage	△	Briefly describe the shell command language and shell variable.
	2.5[2] Process	• Concept of Process	◎	Introduce the concept of process.
		• Interprocess communication	○	Describe how to make an interprocess communication.
		• Control of Process	○	Describe how to control the execution of process.
		• Concept of Filter	○	Introduce the concept of filter and give examples.
	2.6[3] Editor	• Line Editor -ed,ex-	◎	Describe the followings: ① Characteristics ② Main functions ③ Useful commands
		• Screen Editor -vi-	◎	
	2.7[1] Documentation	• Outline	◎	Describe the standard procedure to make documents.
		• Nroff command	○	Provide the main functions and examples of usage.
		• Utility	○	Describe the following document utilities briefly: ① Document macro package ② Column utility ③ Table layout utility

Subject : SOFWARE RESOURCE

3 – 2 – 21

Topics	Sub-topics	Notes	L	Comments
	2.7 [2] Basic Commands	• Process Control Commands for user	○	List up some basic commands of each categories and give simple examples.
		• Communication Commands	○	(1) PS, sh, wait, kill, nice, at...
		• File Handling Commands	○	(2) echo, write, who, mesg, mail, mail, Xsend, xget enroll, calendar...
		• Others	△	(3) cmp, crypt, diff, file, find, join, pack, pcat, unpack, rev, sort, grep...
				(4) uucp, uux, uulog, uucleon, uustat, uusub, uuto, uupick, cu
	2.8 [1] Installation and Operation	• Installation	○	List up the procedures for system installation and describe each procedure briefly.
		• Operation	○	Describe the daily operation and functions for system maintenance.

Subject : SOFTWARE RESOURCE — 3 —24

Topics	Sub-topics	Notes	L	Comments
3. System Programming	3.1[1] Introduction	• Necessity and purpose	◎	
		• Kinds of System programming	○	Give several examples of system programming.
	3.2[2] System Macros	• Concept of System Macros	◎	Introduce system macros as routines which give smooth-skined services to programms.
		• System Control Macros	○	Briefly describe the characteristics and list up several macros.
		• Data Control Macros	○	
		• Message Control Macros	○	
		• System Service Macros	○	
	3.3[1] Others	• Concept of Semaphore	◎	Introduce the concept of Semaphore as a communication method between tasks.
		• Linkage Parameters for Task control	○	Briefly describe the main parameters to link multi task programs.

Subject : SOFTWARE RESOURCE

1 – 4 – 2

Topics	Sub-topics	Notes	L	Comments
4. Others	4.1 [1] Virtual Machine	• What is a Virtual Machine?	◎	
		• Configuration and functions.	○	

Diploma in Computer Technology

Subject	Title	3.1 File structures			
	Responsible	Expert	K.Osada		
		C/P	Paheerathan, Jacintha		
Aim	Understanding the file concept, file organization and access method				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	30				30
Preceding Subject~~ect~~					
Succeding Subject	Program language (COBOL)				
Objective	~~Upon successful completion~~ of this subject, student should be able to 1.Acquire the knowledge about file media. 2.Understand the kinds of file and each characteristics. 3.Understand each organization method and access method				
Contents	1.Fundamental concept of file 2.Sequential file 3.Direct file 4.Indexed sequential file 5.Partitioned file 6.VSAM file 7.Flexible disk file				
Remarks					

Mode of Assesment		
	Written test	50%
	Practical test	30%
	Assignment	20%
	Report	
	Oral	

Date : 15 Jul. 1988

By : K.Osada

Institute of computer technology

Subject :

Topics	Sub-topics	Notes	L	Comments
1.Fundamental concept of file	1.1[1] Introduction	What is a file	△	Using familiar example, explain the concept of file
		Record and file	△	Bit Byte Data field Record
		Main storage and auxiliary storage	○	File storage media DASD(Direct access storage device)
	1.2[3] Features of magnetic tape device	Magnetic tape device	○	Describe the construction of the devices Give some data of performance of typical devices
		Characteristics of Magnetic tape	○	Length, Track, Tape speed, Density BPI BOT, EOT marker Write enable ring
		Blocking	○	Inter record gap (IRG) Inter block gap (IBG) Logical record and physical record Explain the necessity of blocking using a example
		Input output check	△	Vertical check longitudinal check Read after write check Parity check
		Label	△	Volume label File header label File trailer label Tape mark
		Calculation of file capacity and read/write time	○	Give some example and question
	1.3[3] Features of direct access storage device	The construction and the function of magnetic disk device	△	Exchangeable disk pack Fixed magnetic disk Give some data of performance of typical magnetic device

Subject :

2 — 1 — 3.1

Topics	Sub-topics	Notes	L	Comments
		Recording method of the data	○	Track Address Gap Recording format Key Count Data
		Concept of cylinder	○	Cylinder number Head number Record number
		Volume table of contents(VTOC) and volume label	○	Internal label Extent
		Direct access to the record and access time	○	Seek Search Data transfer
		Calculation of file capacity and read/write time	○	Give some example
	1.4[0.5] Record format	Types of record format	△	Fixed length record Variable length record Record descripter word Undefined length record Spanned records
	1.5[1] Types of file	Classification by user	△	System file working file User file
		Classification by use way of data	△	Master file / Primary file Transaction file Reference file Historical file Spool or output file
		Classification by use duration	△	Permanent file Temporary file
		Classification by number of volume	△	Multi file volume Multi volume file
		Classification by media	△	I/O device Auxiliary storage
		Classification by label	△	
		Classification by file organization method	○	Explain as a introduction to further topics Describe the out line and characteristics, and also

Subject : /

3 — / — 3. /

Topics	Sub-topics	Notes	L	Comments
				how to use each method Serial/sequential file Direct or random file Indexed sequential file Partitioned file VSAM files

Subject :

1 — 2 — 3.1

Topics	Sub-topics	Notes	L	Comments
2.Sequential file	2.1 [0.5] File creation	Organization	△	Control field Key field
		Sequential file sorting and merging	△	Ascending order Descending order Sort/merge program
		Taking out the record	△	Sequential access
	2.2 [2] Magnetic tape sequential file	Sequential file update concept	○	Give the practical example and flowchart to each processing Record insertion Record update Record deletion Identification code
	2.3 [1] Magnetic disk sequential file	Record update processing	○	Give the practical example and its flowchart.
		Record insertion processing	○	Explain the difference from the magnetic tape sequential file
		Record deletion processing	○	Reorganization Delete character

Subject :

1 — 3 — 2. 1

Topics	Sub-topics	Notes	L	Comments
3.Direct file	3.1[3] File structure	What is a direct file	○	Characteristics Record address(CCHHR) Count area Key area Data area Record without key Record with key
		Kinds of addressing	○	Real addressing Relative addressing Relative block number Relative track number Key
		Kinds of addressing method	○	Direct addressing method Reference table method Indirect addressing method Randomizing (Hashing) Key conversion Dividing method Radix transformation method Midsquare method Folding method Polynominal method Bucket type direct files
		Management of synonym record	○	Home address Synonym address Sequential method Chain method Bucket method Packing factor (density)
	3.2[1] File processing	Creating the file by direct addressing method	○	dummy record
		Creating the file by indirect addressing method	△	
		Record update Record insertion Record deletion	△	Using chart, explain each process

Subject : 9.

1 — 45 — 3.1

Topics	Sub-topics	Notes	L	Comments
4.Indexed sequential file	4.1 [2] File structure	Prime data area	△	
		Index area	O	Track index Cylinder index Master index Explain the access method using chart
		Overflow area	O	Cylinder overflow area Normal entry item Overflow entry item Chaining of overflow record Link field General overflow area
	4.2[1] file creation and processing	File creation	△	Using chart, explain how to generate the indexes
		Processing indexed sequential file	O	Sequential processing Random processing Using some chart, explain each process File access with indexes Record renewal Record addition record deletion Reorganizing a indexed sequential file
5.Partitioned file	5.1[0.5] File structure	Organization	△	Directory Member Subfile The characteristics
		Directory area	△	Member entry items Member name Relative track address Tag field User data
		Data area	△	Re-using the space of deleted subfile
	5.2[0.5] File processing	Creation	△	Using a figure, explain each process
		Take out the member and record processing	△	
		Addition and deletion of the member	△	Reorganization

Subject : 5.

1 — 6 — 3. 1

Topics	Sub-topics	Notes	L	Comments
6.VSAM file	6.1[1] Types of VSAM files	What is the VSAM	△	The characteristics
		Types of file organization	○	Data set Entry sequenced data set(ESDS) Key sequenced data set (KSDS) Relative record data set(RRDS)
	7.2[3] File structure	Whole structure	○	Data space Control area(CA) Control interval(CI)
		Structure of CI	○	Record definition field (RDF) Control interval definition field(CIDF) Relative byte address(RBA) Free space Independency from device
	6.3 [4] File creation and processing	ESDS	○	Creating ESDS Take out the record record renewal,addition and deletion
		KSDS	◎	Components of KSDS Index component Data component Cluster Access method service (AMS) Free space Free CI Index CI, Index CA Data CI Sequence set Index set Sequential access Pointer Reverse sequential access Random access Jump and sequential access Split CI Split CA
		RRDS	○	Slot Relative record number (RRN)

Subject :

2 — 6 — 3.1

Topics	Sub-topics	Notes	L	Comments
				Hashing Process of synonym record Space slot Random access Jump and sequential access

Subject :

1 — 7 — 3.1

Topics	Sub-topics	Notes	L	Comments
7.Flexible Disk File	7.1[0.5] Flexible disk and device	Appearance of flexible disk	△	Write protect notch Head access hole Index hole etc.
		Kinds of flexible disk	△	Size Recording surface Recording format BPI, FM, MFM Track density TPI
		Storage capacity of flexible disk	△	
		Formatting a flexible disk	△	
	7.2[0.5] Data File on flexible disk	Flexible disk format	△	Cylinder identification Pysical cylinder number Logical cylinder number Track Sector identification Pysical sector number Logical sector number
		Sequential access to flexible disk	△	
		Random access to flexible disk	△	Beginning of extent (BOE)

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Subject	Title : 3.2 DATA BASE SYSTEMS				
	Responsible	Expert	Yoshio Niizeki		
		C/P	S.J.Paheerathan, S.A.U.Gunasekara		
Aim	Understanding the principle of database necessary for the logical design of database, logic necessary for constructing database, physical technique for establishment, various functions of the typical two types of DB (,Codasyl and Relational).				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	45	0	15		60
Preceding subjects	1.File 2.COBOL 3.Software				
Succeeding subjects					
Objective	Upon the successful completion of this subject, Students should be able to, (1) Understanding the basic knowledge about the logical/ physical design, construction and establishment of database. (2) Explain the difference between the CODASYL type and Relational type database.				
Contents	1.Basis of the Data Base 2.Hierarchical type DB 3.CODASYL type DB 4.Relational type DB 5.Future DB				
Remarks	Use actual example on the explanation of analysis and design of database.				
Mode of Assessment	Written test	40			
	Practical test	20			
	Assignment	20			
	Report	20			
	Oral	0	Date :10 .Dec .'87		
			By :Y .Niizeki		

Subject : DATA BASE SYSTEMS 1 — 1 →3.2

Topics	Sub-topics	Notes	L	Comments
1. Basis of the Data Base Systems	1.1 [1] Introduction	• What is Data Base?	◎	Give the definition of Data Base and discuss about the purpose and the role of Data Base in the information processing system.
		• Characteristics	◎	Describe the several characteristics of Data Base comparing with the file system including its advantages.
		• History	△	
		• Types of DB/DBMS	○	Introduce the various types of DB/DBMS as the following. • CODASYL type (Network) • IMS type (Hierarchical) • TOTAL type (Linked File) • Query type (including Relational type) & Inverted

Subject : DATA BASE SYSTEMS 2 - 1 - 3.2

Topics	Sub-topics	Notes	L	Comments
	1.2 [3] Foundamental principle of DBMS	· Data model	◎	Explain the following structures as data model · logical/physical structure · heirarchial structure · network structure · relational structure
		· Basic configuration of DBMS	◎	Explain the basic configuration of DBMS by introducing the following terms. · User's view, Schema, subschema, conceptual schema, external schema, internal schema, table,...
		· Basic functions of DBMS	◎	Describe the following items as basic functions of DBMS · DataBase access management · Pgram/data independency · Logical/physical independency · Integrity of data · Minimal data redundancy · Ease of use · Shared use of data · Security/Recovery · Ease of maintenance · Language processors · Utility programs

Subject : DATA BASE SYSTEMS 3 - 1 - 3.2

Topics	Sub-topics	Notes	L	Comments
		· Conceptual modelling	◎	Explain the following typical data modelling method. · ERD = Entity Relationship Diagram · FDD = Functional Dependency Diagram
		· Normalization Theory	◎	Introduce the normalization theory as a principle for database design by using the following forms. · First normal form · Second normal form · Third normal form · Boje-Codd normal form · Fourth normal form

Subject : DATA BASE SYSTEMS

1 – 2 – 3.2

Topics	Sub-topics	Notes	L	Comments
2. Hierarchical type DB	2.1 [0.25] Overview	· Basic principle		Explain the basic principle by using the logical and physical data base.
	2.2 [0.5] File Organization	· HSAM (Hierarchical Sequential Access Method)		Explain their storage structures by using the same example.
		· HISAM (Hierarchical Indexed Sequential Access Method)		
		· HDAM (Hierarchical Direct Access Method)		
		· HIDAM (Hierarchical Indexed Direct Access Method)		
	2.3 [0.25] DML	· Commands		Explain the several commands of DML.
		· Example		Explain the example of using the above DML commands.
	2.4 [0.5] Others			Explain some pitfalls of Hierarchical type DB.

Subject : DATA BASE SYSTEMS 1 - 3 - 32

Topics	Sub-topics	Notes	L	Comments
3. CODASYL type DB	3.1 [1] Overview	· Basic principle and configuration	◎	Describe the basic principle and configuration of CODASYL type DB in detail.
		· Establishment of data base system	◎	Explain the procedures how to establish the data base system. · Analysis/design · Database generation · Use of database · Operation
	3.2 [3] Data structure	· Concept of record and set	○	Introduce the concept of record and set. Also explain about the following pointers · NEXT pointer · PRIOR pointer · OWNER pointer
		· Logical data structure	○	Explain about the following six types of logical data structures · Single · Hierarchical · Tree · Multi-member · Composite network · Simple network
		· Optimization of the data structure	○	Describe briefly how to optimize the data structure by using some examples.
		· Logical data storage	○	Explain about the logical data storage by introducing the following terms. Area, Page, Line, Database key
		· Record processing characteristics	○	Introduce the following terms · Location mode (direct, calc, via-set) · Database entry point
		· Set processing characteristics	○	Introduce the following terms · Set membership · Ordering member records of set · Set selection

Subject : DATA BASE SYSTEMS 2 - 3 - 3.2

Topics	Sub-topics	Notes	L	Comments
	3.3[1] Storage structure	· Factors for storage structure	○	Explain about two factors which determine the database storage structure · distribution of stored data · storage space of the database
		· Distribution of stored data	○	Explain about the distribution of stored data in detail by using actual examples.
		· Database storage space	○	Explain about the relationship between logical structure and physical structure.
	3.4[7] Database system analysis/design	· Overview	○	Explain the procedure how to design the database system into the following five steps briefly. · Clarification of requirements · Analysis of data · Logical design of data structure · Physical design of data storage · Evaluation Use one actual example in this sub-topic.

Subject : DATA BASE SYSTEMS　　3 - 3 - 32

Topics	Sub-topics	Notes	L	Comments
		· Clarification of requirements	△	Explain the items must be clarified.
		· Analysis of data	△	Explain the following two procedures. · File analysis · Related files analysis Also explain a document as a result of this step.
		· Logical design of data structure	△	As a following step after the analysis of data explain how to design the data structure into the following three parts. · Mapping into the data structure · Optimization of the data structure · Establishment of the structural characteristics Also explain the documents as a result of this step.
		· Physical design of data storage	△	Explain how to design the data storage into the following three parts. · Data storage in data area · Data storage in secondary index area · Data storage in range Also explain the document as a result of this step.

Subject : DATA BASE

4 - 3 - 3.2

Topics	Sub-topics	Notes	L	Comments
		· Evaluation	△	Explain how to evaluate the following items. · performance · capacity · recovery · security
	3.5[1] Database generation	· Overview	○	Explain the procedures in order to generate the database environment
		· Schema creation	△	Explain the procedures how to create the schema object.
		· Initial database creation	△	Explain the procedures how to load data into database.
	3.6[16] [9CP] Use of the database	· Overview	○	Explain the procedures how to use the database. · creation of subschema · creation of application program
		· Subschema creation	△	Explain the followings. · concept · rules · method to make oject
		· Creation of application program	△	Explain the followings. · method to make oject · access path · relation between subschema and application prog.

Subject : DATA BASE SYSTEMS　　5 − 3 − 3.2

Topics	Sub-topics	Notes	L	Comments

		· DML commands	○	Explain several database access procedures by using DML commands
				· Retrieval procedure
				  ├ by using key
				  └ by using set
				· Update procedure
				  ├ STORE
				  ├ ERASE
				  └ MODIFY

		· End user facility	○	Explain the facility from end user.
		· Protection of database privacy	△	Explain the following two types of protection of database privacy. · protection of database privacy · protection of schema and subschema privacy.
	3.7 [2] Operation	· Data security and integrity	○	Explain the following two items. · database recovery · shared use and exclusive control (including deadlock)

		· Database improvement	○	Explain the following two items.
				· monitoring and evaluation
				· improvement
				  ├ reorganization
				  └ restructuring

Subject : DATA BASE SYSTEMS 1 - 4 - 32

Topics	Sub-topics	Notes	L	Comments
4. Relational type DB	4.1 [1] Overview	· What is relational DB?	◎	Explain the difference between the CODASYL type DB and Relational DB.
		· Characteristics	◎	Explain the advantages against the CODASYL type DB.
		· Establishment of data base system	◎	Explain the procedures how to establish the relational data base system · Analysis/design · Database generation · Use of database · Operation
	4.2 [2] Basic knowledge	· Corept of table	○	Introduce the corept of table and explain the kinds of tables.
		· Logical structure	○	Explain the following tables. · Basic table · Virtual table
		· Physical structure	○	Explain the following items. · Inverted file · Structure of storage area

Subject : DATA BASE SYSTEMS　　2 – 4 – 3.2

Topics	Sub-topics	Notes	L	Comments
	4.3[4] Database system analysis/design	· Overview	○	Explain the procedure how to design the database system into the following three steps briefly · Clarification of requirement · Analysis of files · Design of tables
		· Clarification of requirement	△	Explain the items must be clarified.
		· Analysis of files	△	Explain the items must be analized. Also explain a document as a result of this step.
		· Design of tables	△	Explain the procedure how to design tables. · Establishment of tables · First normalization · Decision of keys · Third normalization Also explain a document as a result of this step.

Subject : DATA BASE SYSTEMS

3 - 4 - 3.2

Topics	Sub-topics	Notes	L	Comments
	4.4[1] Database generation	• Initial set up	△	Explain this procedure into the following three steps. • Calculation of storage capacity • Allocation • Initialization
		• Registration and definition of resources	△	Explain how to register and define the following resources. • user/group • files • basic tables • virtual tables • programs • operations • access rights • record sequence number • alias

Subject : DATA BASE SYSTEMS 4 — 4 — 32

Topics	Sub-topics	Notes	L	Comments
	4.5 [10.5] [6(P)] Use of the database	· Overview	○	Explain the two types of use of the relational database. · Enduser access · Programmer's language access
		· Enduser access	○	Explain the basic command operation by using the display examples.
		· Programmer's language access	○	Explain the basic example of using programmer's language.
	4.6 [2] Operation	· Monitorring	△	Explain how to get the information for management and utilization of relational database.
		· Improvement	△	Explain the following two items. · Evaluation · Reorganization
		· Integrity and security	△	Explain the following two items. · database recovery · shared use and exclusive control.

Subject : DATA BASE SYSTEMS

5 – 4 – 3.2

Topics	Sub-topics	Notes	L	Comments
	4.7[1.0] Practical Relational DBsystems	· Structured Query Language		Explain briefly the characteristics of SQL being standardized by ISO.
		· Query By Example		Explain briefly the characteristics of QBE.

Subject : DATA BASE SYSTEMS

Topics	Sub-topics	Notes	L	Comments
5. Future Data Base System	5.1[10] Distributed Data Base System	· Overview		Introduce the concept of distributed data base system · Homogeneous type · Heterogeneous type
		· Characteristics		Explain the characteristics from the the following points of view. · Reliability · Performance · Flexibility · Management of distributed data
		· Basic principle of distributed DBS		Explain the basic principle how to distribute the data base.
		· Examples		Explain the following poctical examples of distributed data base · SDD-1 · Distributed INGRESS · System R · Multi-base · ENCOMPASS

Subject : DATA BASE SYSTEMS　　2 - 5 - 3.2

Topics	Sub-topics	Notes	L	Comments
	5.2[0.5] Data Base Machine	• Overview		Introduce the concept of data base machine and explain the following five types. • SPIS = Single Processor Indirect Search • SPDS = Single Processor Direct Search • MPDS = Multiple Processor Direct Search • MPIS = Multiple Processor Indirect Search • MPCS = Multiple Processor Combined Search
		• Trend		Explain the trend of research in the following two periods. • 1970's XDMS RAP CASSM RARES • 1980's ADABAS IDM500 System 38 DIRECT DSDBC

Subject : DATA BASE SYSTEMS　　3 – 5 – 3.2

Topics	Sub-topics	Notes	L	Comments
	5.3[05] Knowledge Base	· Introduction		Explain the relationship between data and knowledge.
		· Representation method of knowledge		Explain the following method for representation of knowledge · Semantic Network · Production System · Frame Theory · Conceptual Dependency · Blackboard Model
		· Examples		Explain the following examples. · Expert System · Natural processing system

SUB. SUB. 4.1

NO.	DATE dd. mm. yy.	PAGE ser. topi. sub.	REVISED POINT	RMK

Subject	Title :4.1:Information Processing systems				
	Responsible	Expert :S.Shibata			
		C/P :S.J.Paheerathan,S.A.U.Gunasekara			
Aim	Understanding types and features of the information processing system and further by considering a typical system (network, database, and office automation). Concept of a system and its substance effectivity through learning its purpose, basic functions and features.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	40				40
Preceding subjects	Information processing and computer				
Succeeding subjects	1.Online system analysis and design 2.Management of computer system				
Objective	Upon the successful completion of this subject, students should be able to: (1) Understand configuration of information processing system. (2) Provide knowledge needed to understand succeeding subject.				
Contents	1.Types and features of a processing system 2.System configuration 3.Computer network system 4.Database system 5.Office automation 6.Other information processing systems				
Remarks					
Mode of Assessment	Written test	100 %			
	Practical test				
	Assignment				
	Report				
	Oral			Date :10.12.1987	
				By :S.Shibata	

Topics	Sub-topics	Notes	Comments
1.Types and features of a processing system	1.1 [1] Batch processing and real time processing	.batch processing	Mass data processing at computer center easy programming
		.Real time processing	Real time, Office site, Small data, High technique programming
	1.2 [1] Remote processing and local processing	.Remote processing	Using center computer, Batch processing, Realtime processing
		.Local processing	Processing at place installed computer
	1.3 [1] Online processing and offline processing	.Online processing	Using communication line
		.Offline processing	ex. X-Y plotter (Media MT. FD)
	1.4 [1] Main computer processing system	.Online real time processing	Terminal, Communication line, transaction processing
		.Sharing the use of a computer	Time sharing, Remote batch processing
		.Time sharing system	Time sharing by hardware
		.Interactive processing	Information retieval programming Response time

Topics	Sub-topics	Notes	Comments
2.System configuration	2.1 [3] Consideration of system configuration	.Requirements	Reliability, Efficiency, Operationality, Operability.
		.View points of consideration	Host, peripheral, Access pass, Distributed system
	2.2 Multiplexing configuration	.Multiplexing of CPU	Duplex system
			Dual system
			Multi-processor system
		.Peripheral equipment configuration	Input output devices Auxiliary memory devices
	2.3 [2] Distributed computer system configuration	.Background of DDP	Why distributed system
			Distributed material
		.Types of distributed data processing system	Vertical type, Horizontal type, Mixed type.

Topics	Sub-topics	Notes	Comments
3.Computer network system	3.1 [ ] An outline of computer network	.Introduction .Effects of computer network	Common use of hardware, software, database.
		.Elements and form of computer network	Computer system, terminal network, node.
	3.2 [3] Type of line connection system	.Concentrated type (star)	CN (Central Node)
		.Disturbed type	Reliability
		.Ring type	Economy
		.Bus type	LAN
	3.3 [ ] Control function of computer network	.Data exchange network	Packet, Routing, Flow control
		.Host side	NCP, Virtual terminal,processing type
	3.4 [3] Communiction protocol	.What is protocol?	Start of communication, Contents of message, format, acknowledgement, check, resending, End of communication
		.Standardization	OSI (7 layers)
	3.5 [2] Local area network	.Feature of LAN	Private network connection between various devices
		.Technical elements of LAN	Network topologies, Access methods
	3.6 [2] Value added network	.Use of VAN	Communication processing, Information processing

Topics	Sub-topics	Notes	Comments
4.Database system	4.1 [4] Concept of database	.Conventional data handling and database concept	Limitation of the conventional method of data handling
		.Determining the modern approach to database	Definition of database, Evaluation of database, Advantage of database
		.Database systems Terminology	Data set, Entity, DBS, DBMS, DBA, etc.
		.Architecture of database system	3 layers structure
		.Standardization: Database models with schemas	Conceptual schema External shema Internal schema
	4.2 [4] structure of database	. Database model	Hierarchical model, Network model, Relational model
	4.3 [2] Database management system (DBMS)	.Background of DBMS development	Common use of data, Data independence
		.Function of DBMS	Schema description Data operation (creation..),Data control (security..)
		.Database languages	Host language, End user language, Command system
		.Data dictionary	
		.Examples of commercial databases	

Topics	Sub-topics	Notes	Comments
5.Office automation	5.1 [1] Concept of office automation	.What is office automation?	Meaning of office definition of OA
		.Classification of office work	Top management, Management, Clerical work.
		.Contrast to OA and EDP	
	5.2 [2] Office automation system	.Image of OA system	Substance of office work, Image of OA system, Progress of OA, Inhouse and wide area OA system
		.Office automation equipment	Facsimile, Electronic mail, Electronic filing system, Word Processor, Office computer, Personal computer.

Topics	Sub-topics	Notes	Comments
6.Other information processing systems	6.1 [1] Factory automation	.Factory automation	CAE Computer Aided Engineering CAT Computer Aided Testing CAR Computer Aided Retrieval
		.Computer aided design/Computer aided manufacturing	Concept of CAD/CAM, System configuration
		.Flexible manufacturing system	NC, Die casting machine
		.Material handling	Material flow, Automatic warehouse, Conveyor
	6.2 [1] Computer graphics	.Business graphics .Use of FA etc	Various graph Image processing technology, CT Scanner CAD/CAM
	6.3 [0.5] Computer assisted instruction	.Computer assisted instruction, Computer management instruction	Hardware, Courseware
	6.4 [0.5] Artificial Intelligence	.AI and Expert system	AI language, hardware

SUB. ______ SUB. 4.2

NO.	DATE dd mm yy	PAGE ser. top. sub.	REVISED POINT	RMK
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Subject	Title	4.2	Data Communication		
	Responsible	Expert	Katsuharu Iwahara		
		C/P	A.P.Madurapperuma, A.P.S.R.Somasiri		
Aim	To provide basic knowledge of the data communication system such as basic structure of the data communication system, data transmission control unit, communication line and system and terminal unit.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	40	0	0		40
Preceding subjects	1.Hardware 2.Software				
Succeeding subjects	1.Online system analysis/design 2.Network system				
Objective	Upon the successful completion of this subject, students should be able to: (1) Understand the basic knowledge of data transmission and components (signaling, protocol, ccp, TDM etc.). (2) Equipped with general knowledge of network architecture and system configuration.				
Contents	1.Data Communication System Outline 2.Data Transmission 3.Data Transmission System Components 4.Reliability of Data Communication System 5.Network Architecture 6.Examples of Data Communication System				
Remarks	Explaining the actual examples of data communication system could be effective for students to understand.				
Mode of Assessment	Written test	80 %			
	Practical test	0			
	Assignment	0			
	Report	20 %			
	Oral	0		Date :10.Dec.1987	
		100 %		By :K.Iwahara	

Subject : Data Communication

1 — 1 — 4.2

Topics	Sub-topics	Notes	L	Comments
1. Data Communication System Outline	1.1 [0.5] Definition	·Definition of data communication system?	○	Examples of data communications system
	1.2 [2] Features	·Data processing categories	○	Offline (batch processing) Online (real-time processing, remote batch processing) Defference between the data communication system and off-line system
	1.3 [2] Components	·Composition of data communication system	◎	Circuit, DTE, DCE, MODEM, CCP, CPU etc.
	1.4 [2] Information Flow	·Classification of data communication system	◎	Inquiry, message exchange, data collection/distribution system
	1·5 [1] Applicability	·Describe applicable businesses for data communjcations system	○	Seat reservation system, banking, sales and inventry control system etc.
	1·6 [0.5] Exercises	·Easy exercises	○	To comprehend data processing categories and four major component

①

Subject : Data Communication

1 − 2 − 4.2

Topics	Sub-topics	Notes	L	Comments
2. Data Transmission	2.1 [0.5] Summary	·Definition of data transmission	○	CCITT, data transmission vs. human communications
	2.2 [2] Data Coding	·Data expression method	○	Binary expression
		·Data coding	○	Combinations of "0" and "1"
		·Standardization of coding	○	ISO/CCITT code etc.
	2.3 [3] Signaling Formation on Baseband Transmission System	·Types of signaling formation of baseband transmission system	○	Single-current and double-current systems
				RZ and NRZ systems
				Bipolar systems
		·Moduration system	○	Amplitude modulation (AM)
				Frequency modulation (FM)
				Phase modulation (PM)
	2.4 [2] Data Transmission System	·Communication system	○	Communication mode (simplex, half duplex full duplex)
				Synchronous system (asynchronous system, character synchronous system , flag synchronous system)
				Communication speed (data signaling rate, data transfer rate)
	2.5 [4] Transmission Control	·Transmission control concept	○	Function of transmission control
				Circuit connection
				Establishment of data link
				Data transferring
				Data link release
				Circuit disconnection

(2)

Subject : Data Communication

2 - 2 - 4.2

Topics	Sub-topics	Notes	L	Comments
2. Data Transmission	2.5 [4] Transmission Control	·Type of transmission control procedures	O	Basic-control procedure
				High-level data link control procedure
				Non-procedure
		·Error control system	O	Needs of error control (error detection·correction)
				Parity check system principle
				CRC system
	2.6 [0.5] Exercises	·Easy exercises	○	To comprehend communication system and five transmission control phases

③

Subject : Data Communication

1 — 3 — 4.2

Topics	Sub-topics	Notes	L	Comments
3. Data Transmission System Compobnents	3.1 [0.5] Summary	·Components of transmission system	○	Communication circuit Data circuit-terminating equipment Data terminal eqipment Communication control processor Line concentrator
	3.2 [3] Communication Circuit	·Types of communication circuits	○	Direct circuit Switching circuit
		·Data switching network	◎	Background of data switching network emergence (limit of telephone switching network, advancement in PCM and LSI technology, progress in switching technology) Type of data switching network (circuit switching network, packet switching network)
		·Applicable techniques for communication circuit	◎	Example of communication circuit Selection of communication circuit Communication circuit configuration
	3.3 [1] Data Circuit-terminating Equipment	·Location of DCE.	○	Types of DCE (MODEM, DSU)
	3.4 [1] Data Terminal Equipment	·Data terminal equipment features	○	Easy operation by any users Place where DTE is installed Location of DTE

④

Subject : Data Communication

α − 3 − 4.12

Topics	Sub-topics	Notes	L	Comments
3. Data Transmission System Components	3.4 [1] Data Terminal Equipment	·DTE configuration	○	Input/output unit Control part
		·Examples of DTE	○	Typical examples of DTE (terminal control processor, teller's maschine and data input/output unit in banking system)
		·General purpose data terminal equipment	○	Configuration etc.
	3.5 [3.5] Communication Control Processor	·CCP role	◎	Location of CCP Application of CCP FEP, RP
		·Function of CCP	◎	To realize a combination of CCP hardware and software
		·Line concentrator	◎	Time Division Multiplexer (TDM) Statistical Time Division Multiplexer (STDM) Frequency Division Multiplexer (FDM)
	3.6 [0.5] Exercises	·Easy exercises	○	To comprehend between MODEM and DSU To realize the constitution of DTE

⑤

Subject : Data Communication

1 — 4 — 4.2

Topics	Sub-topics	Notes	L	Comments
4. Reliability of Data Communication System	4.1 [0.5] Summary	·Need of reliability	○	To describe an influence on society
	4.2 [1.5] Reliability Standard	·Availability	○	Relation between MTBF and MTTR
	4.3 [1] RAS Technonogy	·RAS technology summary	○	Reliability, Availability, Serviceabilty
		·Redundant design	○	Examples of redundancy of the data transmission circuit

(6)

Subject : Data Communication

1 — 5 — 4.2

Topics	Sub-topics	Notes	L	Comments
5. Network Architecture	5.1 [0.5] Summary	·Development of data communication	△	Individual data communication system , data communications network
	5.2 [2] Data Communications Network	·Particulars of data communications network development	○	Arrival of on-line system Development of effective utilization of communications lines Introduction of front-end processor Communication between computers Function distribution and utilization of digital switching network
		·Objectives of data communications networks	○	Some examples
	5.3 [2.5] Network Architecture	·Network architecture requirement	○	Role of network architecture, ISO(OSI)
		·Summary of network architecture protcol	○	Modeling (node, link, process) Processing hierarchization (OSI 2categories, 7 layers) Protocol and interface (relationship of layers, protocol and interface)
	5.4 [0.5] Exercises	·Easy exercises	○	To comprehend network architecture and hierarchial processing

⑦

Subject : Data Communication

1 - 6 - 4.2

Topics	Sub-topics	Notes	L	Comments
6. Examples of Data Communication System	6.1 [0.5] Nationwide Banking System	·All banks in Japan	◎	Message switching system which connects over 5000 banks in Japan and uses the leased communication circuits
		·System configuration	○	Conceptual diagram Functions of RC
	6.2 [0.5] ANSER	·Shared audio information system using public telephone network	◎	Information notice service Inquiry service
		·System configuration	○	Center and subscriber configuration
	6.3 [0.5] AMEDAS	·Automated meteorological data acquistion system	◎	Constructed to monitor abnormal meteorological phenomena such as typoon, concentrated rainfall which vary complexly in geography and in time and to provide prompt meteorological data to prevent meteorological disasters
		·System configuration	○	Conceptual diagram of meteorological robot and etc.
	6.5 [0.5] Other System		△	

(8)

SUB.

SUB. 4.3

NO.	DATE dd. mm. yy.	PAGE sen. top. sub.	REVISED POINT	RMK

SUB.

SUB. 4.3

NO.	DATE dd. mm. yy.	PAGE sec. top. sub.	REVISED POINT	RMK

Diploma in Computer Technology

Subject	Title	4. 3 NETWORK SYSTEMS			
	Responsible	Expert	N.SHINODA		
		C/P	Somasiri ,Jayasinghe		
Aim	Acquiring Basic knowledge and techniques for design and management of the network system.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	29	0	0		29
Preceding Subject	Data communication Information processing system				
Succeding Subject					
Objective	Upon the successful completion of this subject, students should be able to : 1. prepare specification of the simple network system 2. understand. the communication techniques and Network system type				
Contents	1. Communication Network 2. Type and feature of Communication Network 3. Transmission control procedure and Network architecture 4. Communication Network software 5. Communication Network system design 6. Installation and use of Communication Network				
Remarks					
Mode of Assesment	Written test	70 %			
	Practical test	10 %			
	Assignment	10 %			
	Report	10 %	Version: 2		
	Oral	0 %	Date : 15th Jul.1988		
		100 %	By : N.SHINODA		

Institute of computer technology

Subject : NETWORK SYSTEMS' 1 — 1 — 7.5

Topics	Sub-topics	Notes	L	Comments
1.Communication Network	1.1[1] Introduction of Communication Network	·Communication and Information processing	○	ARPANET
		·Function of Communication network	○	Inquiry and response Message switching Data collection and distribution Remote batch
		·Communication network view	○	
	1.2[2] Example of Communication Network system	·Online realtime systems	○	Time sharing system Transaction processing system
		·Office automation system	△	(Information processing system explain OA and FA in detail)
		·Factory automation system	△	
		·Laboratory automation system	○	CAM Computer Assisted Measurement RA Research automation
		·Home automation system	○	House control Security Energy management Home shopping Home banking
		·Information retrieval system	○	Data-IRS Fact-IRS Document-IRS KWIC KWOC Thesaurus SDI Selective Dissemination of Information Q-A Question-Answer
		·Personal computer communication	△	
		·Video tex	△	IP Information provider PLP Presentation Level Protocol CEPT Conference of European Post and Telephone NAPLPS North American Presentation Level Protocol Syntax CAPTAIN Character And Pattern Telephone Access Information Network
		·Facsimile communication	△	G1,G2,G3,G4

Subject : [illegible]

[illegible]

Topics	Sub-topics	Notes	L	Comments
2.Type and feature of Communication Network	2.1[3] Line service and Common carrier	·Type of communication line service		Leased line Telephone line High speed digital Switched line Telephone line Telegraph line DDX Digital Data eXchange Circuit switch Packet switch Satellite communication
		·Common carrier		ATT,BT,NTT,C&W INTELSAT INMARSAT
	2.2[2] Local Area Network(LAN)	·Bus type		Ethernet CSMA
		·Ring type		Token passing Polling
		·Star type		Digital PBX
		·Wireless type		
	2.4[2] Value-Added Network	·Type and feature of VAN		IN NET1000 ISDN Integrated Service for Digital Network TELENET

Subject : NETWORK SYSTEM

/ — 3 — ..

Topics	Sub-topics	Notes	L	Comments
3.Transmission control procedures and Network architecture	3.1[1] Network architecture	·Feature		
		·Standardization	○	ISO International Organization for standardization IEEE CCITT
		·Structure	○	Entity Service Protocol
	3.2[3] OSI model	·Physical layer	○	X.20,X.21,V24 MODEM,NCU,CCP
		·Datalink layer	○	HDLC Sequense control CRC,Flag,Transparency
		·Network layer	○	X.25 VC,PVC
		·Transport layer	○	End to End communication
		·Session layer	○	Flow control Synchronous
		·Presentation layer	○	Code
		·Application layer	○	Job transfer File transfer

Subject : NETWORK SOFTWARE　　1－4－7.

Topics	Sub-topics	Notes	L	Comments
4.Communication Network software	4.1[1] Type of Communication Network software	·Distributed data processing network ·Computer communication technique	○ ○	Vertical distribution Horizontal distribution SNA DCNA DINA
	4.2[1] Host node software		○	NCP Network Control program FNP Front End Processor
	4.3[2] Repeater software		◎	Gateway PAD Packet Assembly and Disassembly Rooting
	4.4[1] Terminal software		○	DTE Data Terminal Equipment DCE Data Circuit terminating Equipment MODEM X.21 PT NPT

Subject : NETWORK SYSTEMS

Topics	Sub-topics	Notes	L	Comments
5.Communication Network system design	5.1[1] System analysis	·Present condition analysis ·End-user analysis ·Future systems	○ ○ ○	
	5.2[1] Construct factors of information networks	·Feature factor ·Performance factor ·Reliance factor ·Connect node ·Extension factor ·Economical factor	○ ○ ○ ○ ○ ○	Response time Throughput time Fault rate MTBF,MTTR Point to Point circuit Multi point system Line concentration system Line multiplexing system TDM,FDM
	5.3[3] Communication Network design	·Choice of communication line ·Investigation of network configuration ·Investigation of communication machine ·Investigation of reliance ·Investigation of safety ·Investigation of software design ·Performance estimate of communication network	○ ○ ○ ○ ◎ ○ ○	Communication service Communication media Redundant design Stand-by system Parallel system Fail soft Fail safe Check point system Cryptography
	5.4[1] Evaluation of introduced Communication Network plan	·Evaluation points ·Evaluation of communication final plan	○ ○	

Subject : ネットワーク システム

Topics	Sub-topics	Notes	L	Comments
6. Installation and use of Communication Network	6.1[2] Installation of Communication Network	・Contract of network use	○	
		・Joint construction of communication network	○	
		・Network software making	○	
		・Node connection	○	
		・Evaluation of communication network	○	Monitoring
	6.2[2] Management of Communication Network use	・Reliance management	◎	Hard ware Intermittent failure Solid failure Initial failure Random failure Wear-out failure Soft ware Fault tolerant
		・Performance management	○	
		・Evaluation and improvement	○	
		・User management	○	Man-machine interface Repairs User information
		・Safety management	○	Privacy protection

SUB. SUB. 4.4

NO.	DATE dd . mth . YY	PAGE sec. top. sub.	REVISED POINT	RMK
1	4. 1 .88	1 - 1 - 4.4	Comments by University of Colombo	
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Subject	Title :4.4:Online System Analysis and Design				
	Responsible : Expert :Katsuharu Iwahara				
	: C/P :K.Weerawarna				
Aim	.Providing the following basic knowledge of online system design: design procedure various calculation (system performance etc.), the way of system configuration decision, system evaluating. .Acquiring techniques of system analysis and design on practice.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	120	0	60		180
Preceding subjects	Hardware,File,Information processing system				
Succeeding subjects					
Objective	Upon the successful completion of this subject, students should be able to: (1) Understand basic knowledge of the system analysis and design. (2) Acquire practical knowledge and techniques concerning the subject design.				
Contents	1.Outline of Online Systems 2.Theory queuing 3.Calculation of System Performance 4.System Simulation 5.Outline of System Design 6.Estimate of the Main Memory 7.File Designs 8.Network Design and Calculation of the number of Terminal units 9.RAS Technology 10.Evaluation of Reliability				
Remarks					
Mode of Assessment	Written test	40 %			
	Practical test	40 %			
	Assignment	0			
	Report	20 %			
	Oral	0		Date :10.Dec.1987	
				By :K.Iwahara	

(4, Jan. 1988)

Subject : Online System Analysis and Design

1 – 1 – 44

Topics	Sub-topics	Notes	L	Comments
1. Outline of On-line Systems	1.1 [2] Definition of On-line Systems	·Introduction	○	What is a system What is system analysis and design
		·On-line and off-line	○	Comparison of on-line and off-line systems characteristics General description for processing modes and system configuration
		·Real-time and batch processing	○	Instantaneous processing mode and non-instantaneous processing mode
		·Modes of data processing and on-line real-time systems	○	On-line real-time systems Time sharing systems Local batch systems Remote batch systems
		·System development life cycle	○	
	1.2 [3] Characteristics of On-line Systems	·Real-time processing and broader coverage	○	Turn-around time Real-timeliness (response time)
		·Considerations for varying arrival rate of transactions	○	Describe the necessity highly sophisticated function
		·High reliability requirement	△	Fail-soft, failure diagnosis failure recovery functions
		·Centralization of information	△	Advantages of centralized information
		·Avoidance of intermediate processes	△	Cost and error reduce
		·Sharing the use of computers	○	Multiprogramming , Grosh's law

(1)

Subject : Online System Analysis and Design

2 - 1 - 44

Topics	Sub-topics	Notes	L	Comments
1. Outline of On-line Systems	1.3 [4] Applications of On-line Systems	·Manufacturing	○	Production control on-line systems
				Manufacturing control systems
				Inventory control systems
				Order/sales control systems
				Manufacturing/marketing integrated systems
				Metabolism robots
		·Transportation	○	Freigt transportation systems
				Seat reservation systems
				Intelligent storage systems
				Container control systems
		·Retailer/wholesaler	△	Broad-area sales/inventory control systems
		·Finance and security	△	Deposit account systems
				Money order/exchange systems
				Integrated banking on-line systems
				Cash-less systems
		·Research and development	○	Data bank system
				TSS
		·Service industry	△	Automated diagnosis systems
				CAI systems
				Information service systems
		·Goverment administration systems	○	Transportation control
				Water supply system
				Broad-area unemployment services

(2)

Subject : Online System Analysis and Design

3 — 1 — 44

Topics	Sub-topics	Notes	L.	Comments
1. Outline of On-line Systems	1.4 [4] Configurations of On-line Systems	·Basic building blocks of on-line systems	○	Terminal devices (transmission controller, teller window machine, data input/output device) Communication link Center facility (main frame unit, peripheral units, additional units, communication control equipment, power supply) Software (control program, application control program, application processing programs, support programs)
		·System reliability and system configurations	○	Simplex sistem Duplex system Dual system Multi-processor system Load share system Tandem system
	1.5 [3] Variations of On-line Systems	·Inquiry system	○	Response time, on-line banking deposit systems etc.
		·Message switching system	○	Banking money order processing systems
		·Composite system	○	Perform both inquire processing and message switching
		·Process control system	△	Traffic control, broadcast program switching, power plant control, water supply control
		·Community system	△	Time sharing system

(3)

Subject : Online System Analysis and Design

1 — 2 — 44

Topics	Sub-topics	Notes	L	Comments
2. Theory of Queuing	2.1 [2] General	·On-line system and queues	○	On-line system queues (input queue for terminal equipment, queue for securing a line, the CPU, a channel and I/O unit, a task, a file) Method to evaluate an on-line system
	2.2 [7] Fundamental Knowledge of Statistics and Probability	·Populations and distribution	○	Finite population, infinite population, average value and variance, probability distribution
		·Frequency distribution	○	Average (representative value) Variance (scale measures dispersion) Standard deviation Coefficient of variation Average and variance of the frequency distribution consisting of 2 stratums (calculation of a center throughput time)
		·Probability distribution	○	Random variable and probability distribution Discrete distribution (distribution function, expected value and variance) Example of discrete distribution (binomial distribution, Poisson's distribution)
		·Continuous distribution	○	Probability density function and distribution function Expected value and variance Examples of continuous distribution (uniform distribution, exponential distribution)
		·Various formulas	○	Easy examples using formulas

④

Subject : Online System Analysis and Design

3 - 2 - 44

Topics	Sub-topics	Notes	L	Comments
2. Theory of Queing	2.3 [6] Queuing Model	·Components of model	○	Source of input (populations) Queuing system (queues, service facility)
		·Source of input (populations)	○	Size of population (infinite population, finite population) Arrival of customers (unit of arrival···individual arrival, group arrival) Arrival of customers and selection of random variable Arrival patterns and probability distribution (random type arrival, regular type arrival, intermediate type arrivalsuper-random type arrival, conclusion)
		·Service facility (server)	○	Number of windows (single window, multiple windows) Service time (service time and distribution)
		·Queue	○	Size of queuing area (model wherein infinite queuing is possible, model where finite queuing is possible, instant model) Order of service (FIFO, LIFO, priority service, random service) Formation of queues (one queue as a whole, by window) Departure of customers (balking, impatient customer)
		·Standard models and Kendall's symbols	○	3 major factors (distribution of arrival of customers, distribution of service time, the number of windows) Standard models Kendall's symbols (M/M/1, E_2/G/3, D/M/3 (10))

(5)

Subject : Online System Analysis and Design

3 — 2 — 44

Topics	Sub-topics	Notes	L.	Comments
2. Theory of Queuing	2.3 [6] Queuing Model	·Intensity of traffic and facility utilization rate	○	The intensity of traffic (traffic density, amount of call, erlang) Facility utilization rate
	2.4 [6] Queue at Single Service Window	·Model at single service window	○	Average number of items arriving in unit time, average number of items queue, average number of items of system, average waiting time for queue, average service time, average waiting time of system, facility utilization rate)
		·Fundamental theorems for a single service window	○	Khintchine, Polloczek
		·Various formulas regarding average value at a single service window	○	M/G/1 (∞), M/D/1 (∞), M/M/1 (∞) M/E_k/1 (∞)
		·Various formulas regarding variance at a single window	○	M/G/1 (∞), M/D/1 (∞), M/M/1 (∞) M/E_k/1 (∞) Examples
		·Special type at a single service window	○	Priority order service permitting no interruption (non-interruption type priority order service) Priority order service permitting interruption (interruption type priority order service)
	2.5 [4] Queue at Multiple Service Windows	·Models at multiple service windows	○	Model of multiple service windows (model of channel device) Single window system with a multiple number of windows (model of master file)
		·Standard model for multiple service windows	○	M/M/M (∞)

⑥

Subject : Online System Analysis and Design

4 — 2 — 4.4

Topics	Sub-topics	Notes	L.	Comments
2. *Theory* of Queuing	2.5 [4] Queue at Multiple Service Windows	·Various formulas at multiple service windows	○	Formulas, grapf and examples
	2.6 [4] Queue of Finite Population	·Queuing model of finite population	●	Describe the case of the number message input the center from terminals Standard model for infinite population
		·Various formulas for finite population	○	M/M/M(N), delay table
		·Defference between a finite population and an infinite population	○	How to select a finite model or infinite model
	2.7 [6] Graph and Queue	·Influence of facility utilization rate on queue	○	Average number of items of system for service window
		·Probability exceeding a given number	●	Probability of the number of items of system Probability of waiting time of system
		·How to find the Percetile	●	Curves for irregular gamma functions
	2.8 [4] Various Numerical Tables	·How to use various numerical tables	●	Poisson's distribution function table $\bar{t}_w/\bar{s}$ table in finite population Irregular gamma function table (G table)
		·Poisson's distribution function table	○	Example

⑦

Topics	Sub-topics	Notes	L	Comments
3. Calculation of System Performance	3.1 [1] General	·Utilization rate of all devices	○	Occupancy rate
	3.2 [2] Target Calculation of System Performance and Standard for Calculation	·Target calculation of system performance	○	System design and calculation of system performance (to confirm desired through-put and response time) System bottlenecks (critical factors in the design of an on-line system) System characteristics (amount of data and response time)
		·Basic data for calculating system performance and elements of this criteria	◎	Kinds of transaction to be processed The amount of traffic to be applied for calculation (ordinary or peak) Message length Required response time Throughput Facility utilization rate
	3.3 [12] An Example of the Calculation of System Performance	·System composition	○	Example
		·Conditions and calculation items	◎	Calculation conditions (kind of business to be handled, amount of traffic, file composition and characteristics of devices, processing time of program, others) Calculation item (utilization rate , average queuing time, 90th percentile)
		·Process flow and time chart	○	Process flow examples Time chart examples
		·Procedure for calculation and queuing model	◎	Describe calculation procedues using formulas of infinite populations

(8)

Subject : Online System Analysis and Design

2 – 3 – 4.4

Topics	Sub-topics	Notes	L	Comments
3. Calculation of System Performance	3.3 [12] An Example of the Calculation of System Performance	·Calculation example	O	CPU (queuing model, utilization rate, average queuing time, variance of waiting time) MTU, Account counter file, Master file·related matters (do as above) Calculation of center throughput time and the 90th percentile of the center throughput time Response time and the 90th percentile of the response time
		·Differences with the real system	O	Handling tasks Handling of polling/selecting system

(09)

Subject : Online System Analysis and Design

1 – 4 – 4.4

Topics	Sub-topics	Notes	L	Comments
4. System Simulation	4.1 [2] Simulation Outline	·Purpose of simulation	○	General
		·To obtain useful results	○	Establishment of a purpose
				Design of the model
				Establishment of standards for evaluation
		·Advantage of simulation	○	Large scale systems and complicated systems
				Expansion and contraction of time is flexible
				Operability and selection of conditions are arbitrary
				Dynamic motion of the system can be clarified
		·The position of simulation in the design of a system	○	Show by the flow chart
		·Results	○	Throuput time, holding time for transactions, utilization rate of each devices, statistics of queues
		·Problem of system simulation	●	Optimum solution cannot be directly obtained from simulation
				Careful evaluation of reasonability of the model
				Stabilization of the model
				Long time to investigate conditions and design a model
				Cost of simulation is large
				The result of simulation tends to be unconditionally
		·Difference between simulation language and general language	●	Input data is done using simulation language

(10)

(15, July, 1988)

Subject : Online System Analysis and Design

1 - 5 - 4.4

Topics	Sub-topics	Notes	L	Comments
5. System Design Outline	5.1 [8] System Analysis Outline	·Structured analysis	O	Activities in the analysis phase Overview of structured analysis Data flow diagram Data dictionary
		·Mini specification		Decision table Decision tree
	5.2 [8] System Design Outline	·Scope of system design	O	Basic examination Basic design Detailed design
		·Basic examination	O	Purpose Contents of examination (understanding the user's intention, investigating and analyzing the basic data, effects by the adoption of the system, decision on the adoption of the system) Preparation of system plan
		·Basic design	O	Deciding the user basic design requirements Examining the models Basic design of processing system (CPU throughput and basic configuration, preparing the process flow and allocating the CPU time, reliabiolity considerations) Software basic design (program design, file design) Line structure design (selection between switching lines and special lines, selecting the transmission speed, determinating the circuit configuration)

(11)

(15, July, 1988)

Subject : Online System Analysis and Design

2 - 5 - 4.4

Topics	Sub-topics	Notes	L	Comments
5. System Design Outline	5.2 [8] System Design Outline	·Basic design		Terminal design Ceter equipment design Design and construction plans System evaluation (evaluating the functions of the system, evaluating processing capability, reliability evaluation) Preparing the basic design book
	5.2 [8] System Design Outline	·Detailed design	O	Deciding the system functions Determinating program structure File design Program specifications
		·Software construction	O	Items involved in software installation
		·Programming and test stages	O	Investigation stage Basic design stage Function design stage Detail design stage Program design stage Programming stage Integration test stage System test stage Operational test stage Top-down versus bottom-up of design and test
		·Design and documentation tools	O	Structured flow charts Warnier Orr diagrams

(12)

(4, Jan. 1988)

Subject : Online System Analysis and Design

1 – 6 – 4.4

Topics	Sub-topics	Notes	L	Comments
6. Estimate of the Main Memory	6.1 [1] General	·Matters to be noted in estimating the main memory	○	Programs Various tables Input/output buffer area Queue Information storage area Work area Constants and operator messages
		·Estimating procedure for the use of main memory	○	Example of procedure for estimating the memory area
	6.2 [12] Estimate Concerning Control Programs and Work Control Programs	·Estimating procedure	○	Example
		·Matters to be noted concerning control and work control programs	○	General Program load method Queu mechanism Priority of processing
		·Program structure in view of design, and example of estimating procedure	○	Program structure in view of design (arrangement of a program as modules, program design) Introduction to system design Structured design techniques Structured charts techniques Module coupling Module cohension Example of procedure for estimating the needed memory capacity)
		·Control dictionary area	○	Control dictionary concerned with (task control, program control, resource control etc)

(13)

Topics	Sub-topics	Notes	L	Comments
6. Estimate of the Main Memory	6.2 [12] Estimate Concerning Control Program and Work Control Program	·Buffer area	O	Kinds and applications of buffers (message receiving buffer, message sending buffer, processing-waiting buffer, input buffer, precautions) Estimating the line buffer capacity (method of allocating main memory, time line buffers are occupied, procedure for estimating the line buffer capacity, method of calculating the line buffer capacity) Estimating the message buffer capacity (relation between message and MBs, locations of MBs and MCI area, calculation procedure, calculating the number of MBs, calculating the number of MCI areas)
	6.3 [3] Estimate Cocerning Work Processing Programs	·Estimating procedure	O	Describe outline
		·Program area	O	Sufficient examinatin needs
		·Table area	O	Table concerning a branch office, file table, table concerning a particular kind of service, table whitch contains constants required for work processing, error message table
		·Final examination	O	Memory capacity should increase about 20%

(14)

Subject : Online System Analysis and Design

1 − 7 − 4.4

Topics	Sub-topics	Notes	L	Comments
7. File Design	7.1 [2] Things to be Noted in File Design			File processing time, File storage efficiency Measure of reliability Extendability Control program On-line batch processing
		·File processing time	○	Choice of optimum file storage device
				Reduction of seek time
		·File accommodation efficiency	◎	Points to be noted concerning the file packing density
				Blocking
				Information formats
				Overflow area
		·Reliability measures	◎	How to cope with an abnormal situations
		·Extendability	◎	Increase of work load
				Expansion and modification of system functions
				Extension measures
		·Examination of control program	○	Methods of organization and access
				File extension and recoganization
				Error processing
		·Batch related with on-line	○	Simply describe
	7.2 [5] File Design	·Determination of file items	○	Key item, display item, management item, calculation item, control item
		·Record design	◎	Record format (record length)
				Determination of record format

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Subject : Online System Analysis and Design　　2 - 7 - 44

Topics	Sub-topics	Notes	L	Comments
7. File Design	7.2 [5] File Design	·Determination of file organization method	O	Response time Relationship of batch processing related with on-line Frequency of updating File accommodation efficiency Key code system Ease of file reorganization Access method (combinations of organization and access methods, example of access method)
		·Calculation of file capacity	○	Indexed sequential type (calculation of the number of blocks accommodated per track, calculation of data area, overflow by record addition, caluculation of index area, calculation of the required number of cylinders
		·Calculation of file capacity	○	Random type Allocation of files (file processing capacity, effect of file errors, on-line related batch processing, file reorganization, allowance of file capacity, VTOC and alternate track)
		·File processing time	O	Indexed sequential access Direct access
		·Reorganization of file	O	File arrangement and file extension Indexed sequencial file Random file
		·Countermeasures for file problems	○	Protection of files File copies

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Subject :
Online System Analysis and Design

1 — 8 — 4.4

Topics	Sub-topics	Notes	L	Comments
8. Network Design and Calculation of the Number of Terminal Units	8.1 [2] Circuit Configuration Design	·Points to notes for design	○	Factors affecting design (characteristics of the required system, economy) Choise between private circuits and exchange circuits
		·Circuit configuration design method	○	General (general circuit configuration design procedure) Calculation of circuit load Terminal installation and transmission route, and examination of charges Calculation of the required number of circuits and integration of circuits Preparation of circuit diagrams Request for installation of the circuits
		·Example of circuit design	○	Preconditions Circuit configuration design
	8.2 [3] Calculation of the Number of Terminals	·Points to note for terminals	○	Choice of terminals Terminal layout Points to note for calculation the number of terminals
		·Method of calculation the number of terminal units	○	General (number of transactions by terminal location, and service level setting time, allowable value for queuing) Calculation of mean holding time of the terminals (estimation of operating time, calculation of circuit waiting time, receive/print time, others)

(17)

Subject : Online System Analysis and Design

2 - 8 - 44

Topics	Sub-topics	Notes	L	Comments
8. Network Design and Calculation of the Number of Terminal Units	8.2 [3] Calculation of the Number of Terminals	·Method of calculation the number of terminal units	O	Calculation of number of terminal units and check against allowable value for queuing Preperation of a list of required number of terminals including additions Miscellaneous

(18)

Subject : Online System Analysis and Design

1 — 9 — 44

Topics	Sub-topics	Notes	L	Comments
9. RAS Technology	9.1 [1] Regarding RAS Technology	·RAS technology concept	△	Reliability, Availability, Serviceability
		·RAS Technology	○	Failure detection techniques (by software or hardware)
				Failure recovery techniques (re-execution, restart, fall back, multiplex configuration, automatic correction)
				Failure repair techniques (to saving and display of data on failures, diagnostic techniques)
				Security measures
	9.2 [1] Causes of failure On-line Systems and Precautions in Design	·General	○	Outline
		·Causes of failure and precautions in design	○	CPU failure, MEM failure, Failure of peripheral equipment, Failure of lines and terminals, Operation errors, Program bugs, Others
	9.3 [3] Actual Failure Prevention Measures for On-line Systems	·General	△	Failure control means and system operation time
		·File back-up	○	Duplication and standby configuration
				Total dump
		·System relief	○	General
				Pre-failure control measures
		·Post failure control measures	○	General
				Processing procedure for system recovery
		·Example of failure control measures	△	Examples of failure control measures in a duplex system

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Topics	Sub-topics	Notes	L	Comments
10. Evaluation of Reliability	10.1 [1] Failures	·General	△	Outline
				Initial failure period
				Random failure period
				Wear out failure period
	10.2 [2] Reference in the Evaluation of Reliability	·Failure rate and repair rate	△	Cases/time
		·Meantime between failure	○	MTBF, MTTFF, MTTF
		·Meantime to repair	○	MTTR
		·Availability	○	A = MTTR / (MTBF + MTTR)
		·Other references	○	Survival probability, Effectiveness
	10.3 [1] Reliability of a system and configuration	·Redundancy	○	Relation between influence of system down and cost
		·Series system	△	Outline
		·Parallel redundancy system	△	Outline
		·Stand-by redundancy system	△	Outline
		·Switching system	△	Outline

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Subject : Online System Analysis and Design

2 -10 -4.4

Topics	Sub-topics	Notes	L	Comments
10. Evaluation of Reliability	10.4 [2] Availability of a Subsystem Involving Maintenance	·Availability of a single device	○	Shannon diagram
		·Availability of two devices	○	Series and parallel systems Stand-by redundancy system Switching system
		·Availability of m-out-of-n systems	○	When m devices out of n devices are normal
		·Availability of a system with subsystems with different availabilities	○	System in whitch subsystems are arranged in series System in whitch subsystems are arranged in parallel
	11.5 [1] System Reliability and MTBF	·Shannon diagrams for availability and MTBF	○	Calculation of MTBF
	10.6 [1] Various Tables	·The respective equations	△	Tables of Availability, MTBF (maintenance system) and MTBF (maintenance m-out-of-n system)
	10.7 [1] Example of Evaluating Reliability	·Calculation availability and MTBF of the duplex system	△	Calculation conditions (failure rates and repair rates of respective devices, conditions for a system failure) Evaluation (model for evaluating the reliability of the entire system, calculation of availability and MTBF of respective subsystems)

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(15 Aug 1988)

Subject : Practicals

1 – annex – 4.4

Online System Analysis and Design (Practitical)

Topics	Sub-topics	Notes	L	Comments
Online System Analysis and Design Practicals	Practicals (50)	·System design techniques The decision to computerise ↓ System analysis ↓ General design ↓ Detailed design		Practical understanding To understand the process which a typical organization would have to go through before making a decision to introduce a computer system to solve its problems. A case study of fictitious company called "Lakdiva Garments Co. Ltd." is used to illustrate the general procedure involved

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Diploma in Computer Technology

Subject	Title	5. 1 PROGRAM DESIGN			
	Responsible	Expert	N.SHINODA		
		C/P	Somasiri ,Gunasekara		
Aim	Understanding the outline of the process in developing the information processing system.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	48	0	0		48
Preceding Subject					
Succeding Subject	Project exercise				
Objective	Upon the successful completion of this subject, students should be able to : 1. prepare the specification of the system process 2. acquire various techniques concerning the program design				
Contents	1. Outline of the system development process 2. Program structure 3. Program linkage 4. Structured design of the program 5. Logic design of the module 6. Common techniques of the logic design 7. Problem of the program design 8. Documentation				
Remarks					

Mode of Assesment	Written test	40 %	
	Practical test	20 %	
	Assignment	20 %	
	Report	20 %	Version: 2
	Oral	0 %	Date : 15th Jul.1988
		100 %	By : N.SHINODA

Institute of computer technology

Subject : PROGRAM DESIGN　　1 — 1 — 3.

Topics	Sub-topics	Notes	L	Comments
1.Outline of the system development process	1.1[1] Preparatory investigation	·Problem analysis	○	System requirement specification
	1.2[2] System analysis	·Problem analysis methods	○	Bar chart Activity network
		·Project plan	○	Organization plan Chief programmer team Test plan Documentation plan Report plan
	1.3[4] Basic design	·Schedule table	◎	
		·New business flow	◎	
		·System structure	◎	HIPO,SADT,DFD
		·I-O design display design report design file and database design	◎	
		·Review	○	Structured walk through Inspection
		·Simulation model	○	
	1.4[2] Detail design	·Program function specification	○	
		·Program structure	○	
		·File specification	○	
	1.5[2] Program development	·Problem of program development	○	
		·Coding and test	○	
		·Structured programming	○	
	1.6[2] System test	·Top down test	○	
		·Bottom up test	○	
		·Test specification	○	Script Load test
	1.7[1] Inplementation and maintenence			Direct conversion Parallel conversion

Subject : PROGRAM DESIGN

1 — 2 — 5.1

Topics	Sub-topics	Notes	L	Comments
2.Program structure	2.1[1] System	·System structure	O	Payroll system Accounting system Inventory system
	2.2[1] Program	·Types of programs	O	Application programs Application packages Utility programs
	2.3[2] Module	·Purpose		
		·Coupling strength	C	Content coupling Common coupling External coupling Control coupling Stamp coupling Data coupling
		·Cohesion strength	C	Functional cohesion Sequential cohesion Communicational cohesion Procedural cohesion Temporal cohesion Logical cohesion Coincidental cohesion
	2.4[0.4] Segment		C	
	2.5[0.4] Statement		C	Composite statement Execution statement Non-Execution statement
	2.6[0.2] Factor		C	Label Operation Operand Comment

Subject : PROGRAM DESIGN　　1 — 3 — 3.1

Topics	Sub-topics	Notes	L	Comments
3.Program linkage	3.1[1] Source program	·Language translator ·Program library	C C	
	3.2[0.5] Object program	·Linkage editor	C	Code segment Data segment
	3.3[0.5] Load module		C	

Subject : PROGRAM DESIGN

1 — 4 — 5

Topics	Sub-topics	Notes	L	Comments
4.Structured design of the program	4.1[1] Concept of structured design	·Decrease complication ·Module size ·Independent module		
	4.2[1] Structured design method	·Three basic control structures		Sequence If then else Do while
	4.3[2] Module divided technique	·Go to less program ·Data flow oriented modular design		Data flow diagram Common function divided technique
		·Data structure oriented modular design		Warnier method Jackson method
	4.4[1] Evaluate Structured design	·Re-examine of the module size and module functions		

Subject : PROGRAM DESIGN 1 — 5 — 5.1

Topics	Sub-topics	Notes	L	Comments
5.Logic design of the module	5.1[1] Concept of logic design 5.2[2] Logic design method		C	
		•Coding sequence	◎	Program head Program identification Fill definition Parameter definition I-O area definition Work area definition Statements of execution
		•Structure coding	C	Indentation Don't use GO TO STATEMENT for backward
		•Naming	C	Program name Module name File name Record name Data item name
		•Comment line	C	
		•Coding form	C	Beautiful coding

Subject : PROGRAM DESIGN

1 − 6 −5.1

Topics	Sub-topics	Notes	L	Comments
6.Common techniques of the logic design	6.1[2] Structure programming flow chart	·Flow pattern	○	Sequence If then else Do while,Do until Case
		·Flowchart symbol	○	Process Flow line Decision Terminal Predefined process Input/Output Connector
	6.2[1] Decision table		○	Condition stub Action stub Action entry Condition entry
	6.3[1] Warnier method		○	Logical sequence Brake down Blank sequence
	6.4[1] Jackson method	·Data structure plan	○	Elementary Sequence Iteration Selection
		·Program structure plan	○	
	6.5[1] NS chart (Nassi/ Shneiderman)	·NS chart symbol	○	Process Decision Do while Do until Case
	6.6[1] Pseudo code	·Feature ·Write method	○	Sequence Decision Do while Do until Case
	6.7[2] HIPO (Hierarchy plus Input Process Output)	·Feature ·VTOC	◎	VTOC Visual Table Of Content
		·IPO diagram	○	General diagram Detail diagram Diagram number
	6.8[1] PAD (Problem Analysis Diagram)	·Feature of PAD	△	Tree structure chart SPD Structured Programming Diagram YACII Yet Another Control Chart II

Subject : PROGRAM DESIGN 2 - 6 -5.1

Topics	Sub-topics	Notes	L	Comments
		•Basic flow figure of PAD		Process box Decision box Case box Repeat box Input box Output box Definition box

Subject : PROGRAM DESIGN

1 - 7 - 5.1

Topics	Sub-topics	Notes	L	Comments
7.Problem of the program design	7.1[1] Hardware technology and cost	・Technical improvement of hardware ・Rapid cost performance	○ ○	Breakeven point IC chip
	7.2[1] Software technology and cost	・Software productivity ・Software cost	○ ○	The ratio of the software cost Application programs Utility programs System level programs Product size Available size Required level of reliability Level of technology
	7.3[1] Necessity of structured program logic		○	Advantages

Subject : PROGRAM DESIGN

1 - 5 -5.1

Topics	Sub-topics	Notes	L	Comments
8.Documentation	8.1[1] Purposes of documentation	·Documentation is necessary for development system	C	Design support Information transfer to others Management support
	8.2[1] Documentation plan		C	
	8.3[2] Project Handbook	·Overview ·Basic development schedule ·Management ·Criterion ·Documentation ·System ·Equipment ·Programming ·Program testing ·Training plan	C C C C C C C C C C	
	8.4[1] Documentation control	·Integrated control ·Review ·Registration ·Modification ·Document code	C C C C C	
	8.5[1] Standardized documentation	·Standardized terminology ·Standardized format ·Procedure for approval ·Documentation system	C C C C	

SUB.

SUB. 5.2

NO.	DATE dd. mm. yy.	PAGE sct. top. sub.	REVISED POINT	RMK

Subject	Title	S.S Programming			
	Responsible	Expert	K.Osada, N.shinoda		
		C/P	Somasiri, Paheerathan		
Aim	Placing the principal objective in building up the ability to construct the program logic correctly and properly, and developing the ability to construct easy-to-understand, simple structured logic. Acquiring program testing techniques.				
Teaching Strategy	Lecture	Tutorial	Practical		Total
	60		30		90
Preceding Subject					
Succeding Subject	Program language				
Objective	Upon successful completion of this subject, student should be able to 1.Complete the most suitable flow chart for given problem, using three basic patterns. 2.Draw a flowchart for single file processing which is 4.Construct proper and structured program 5.Draw a flowchart for matching type file processing. 6.Draw a flowchart for table handling and internal sort 7.Draw a flowchart for science and technology 8.Carry out a easy program test				
Contents	1.Fundamental concept of flowchart 2.Three basic patterns and their application 3.Single file processing 4.Structured program logic 5.Multi-file processing 6.Table operation 7.Flowchart technique for science and technology 8.Program test				
Remarks					
Mode of Assessment	Written test				
	Practical test				
	Assignment				
	Report				
	Oral			Date :	10 Dec. 1987
				By :	K.Osada, N.Shinoda

Institute of Computer Technology