SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF MEDICAL ELECTRONICS

QUESTION BANK

VI SEMESTER

EC3464 – MICROPROCESSORS, MICROCONTROLLERS AND INTERFACING

(Common to ECE and Medical Electronics)

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UNIT I - THE 8086 MICROPROCESSOR

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines.

	PART – A			
S.No.	**Questions**	**CO**	**BT Level**	**Competence**
1	List out the functional parts of 8086 CPU.	CO 1	BTL 1	Remembering
2	Define pointers and index registers?	CO 1	BTL 1	Remembering
3	Differentiate between Macro and Subroutine.	CO 1	BTL 2	Understanding
4	Name the different types of interrupts supported by 8086.	CO 1	BTL 1	Remembering
5	Write the flags present in the 8086 processor.	CO 1	BTL 1	Remembering
6	What is meant by pipelining?	CO 1	BTL 2	Understanding
7	Discuss about interrupt service routine?	CO 1	BTL 2	Understanding
8	Write down the addressing mode of the instruction MOV AX, 55H [BX] [SI].	CO 1	BTL 1	Remembering
9	Calculate the physical address, when segment address is 1085H and effective address is 4537H.	CO 1	BTL 2	Understanding
10	Mention the instructions used for BCD arithmetic in 8086.	CO 1	BTL 1	Remembering
11	Classify the machine control instructions available in 8086.	CO 1	BTL 1	Remembering
12	Define assembler.	CO 1	BTL 1	Remembering
13	Show how the 2 byte INT instruction can be applied for debugging.	CO 1	BTL 1	Remembering
14	How would you use carry and zero flags that reflect the result of the instruction CMP BX, CX?	CO 1	BTL 2	Understanding
15	List out the purpose of segment registers in 8086?	CO 1	BTL 1	Remembering
16	Outline the software operations that are possible in 8086 when compared to 8085.	CO 1	BTL 2	Understanding
17	The offset address of data is 341BH and the data segment value is 123AH. Generate the physical address of the data.	CO 1	BTL 1	Remembering
18	Write the interrupt priorities of 8086.	CO 1	BTL 2	Understanding
19	Mention any four miscellaneous instructions in a 16 bit processor.	CO 1	BTL 2	Understanding
20	Mention the need for modular programming.	CO 1	BTL 1	Remembering
21	Specify the maximum memory size that can be addressed by the 8086 Processor?	CO 1	BTL 1	Remembering
22	Give the difference between segment register and general purpose register?	CO 1	BTL 2	Understanding
23	Outline the difference between the instructions MOV AX, 2437H and MOV AX, [2437H].	CO 1	BTL 2	Understanding
24	Compare CALL and PUSH instruction.	CO 1	BTL 1	Remembering
	PART – B			
1	What is an assembler directive? Explain any 5 assembler	CO 1	BTL 3	Applying

S.No.	Questions	CO	BT Level	Competence
	directive with an example. (16)			
2	Write an 8086 ALP to convert BCD data to Binary data. (16)	CO 1	BTL 3	Applying
3	Describe the internal architecture of 8086 microprocessor with neat diagrams. (16)	CO 1	BTL 4	Analyzing
4	Describe in detail about each addressing mode with an example. (16)	CO 1	BTL 3	Applying
5	Write a program to add the elements of two matrices using the 8086 instruction set. (16)	CO 1	BTL 3	Applying
6	Write briefly about interrupts and its types. Explain the control flow of the microprocessor in detail when interrupt occurs. (16)	CO 1	BTL 4	Analyzing
7	Give detailed note about the following terms: Procedures and Macros. (16)	CO 1	BTL 4	Analyzing
8	With the help of an algorithm, write an assembly language program to sort an array of 10 elements in descending order. (16)	CO 1	BTL 4	Analyzing
9	Test whether the input string is palindrome or not using 8086 ALP. Illustrate with a palindrome and a non-palindrome string (16)	CO 1	BTL 3	Applying
10	Illustrate the functional description of 8086 microprocessor with a neat sketch. (16)	CO 1	BTL 4	Analyzing
11	Write an assembly language program to search data in an array using 8086 instruction set. (16)	CO 1	BTL 4	Analyzing
12	Classify the 8086 string manipulation and give detailed explanation with appropriate examples. (16)	CO 1	BTL 3	Applying
13	Write an ALP to compute multiplication of two 16 bit numbers using 8086 instruction set. (16)	CO 1	BTL 4	Analyzing
14	Explain the register and memory organization of the 8086 microprocessor. (16)	CO 1	BTL 4	Analyzing
15	Explain the data transfer group and logical group of 8086 instructions with necessary examples. (16)	CO 1	BTL 3	Applying
16	Describe the principle if linking and relocation in 8086 microprocessor. (16)	CO 1	BTL 4	Analyzing
17	List the advantages of modular programming and illustrate the process by which the modules assembled separately are linked together and programs are prepared for execution. (16)	CO 1	BTL 3	Applying

UNIT II - 8086 SYSTEM BUS STRUCTURE				
8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming –System bus structure, Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.				
PART – A				
S.No.	**Questions**	**CO**	**BT Level**	**Competence**
1	Define Bus.	CO 2	BTL 1	Remembering

2	State about External & Internal Bus.	CO 2	BTL 1	Remembering
3	Name the two different modes of operation used in 8086.	CO 2	BTL 1	Remembering
4	Distinguish the LOCK and TEST signal?	CO 2	BTL 2	Understanding
5	Define the term ' Multiprogramming'	CO 2	BTL 1	Remembering
6	Explore the function of QS_1 and QS_0.	CO 2	BTL 2	Understanding
7	Draw the timing diagram of Interrupt acknowledgement on a minimum mode system.	CO 2	BTL 2	Understanding
8	Examine the signals used by 8086 to demultiplex the address/data and to control the data bus	CO 2	BTL 1	Remembering
9	Discuss about Semaphore used in 8086.	CO 2	BTL 2	Understanding
10	Discriminate the minimum mode and maximum mode of operation.	CO 2	BTL 1	Remembering
11	Illustrate the stages of pipelining.	CO 2	BTL 2	Understanding
12	Name the various advanced microprocessors.	CO 2	BTL 1	Remembering
13	How is a clock signal generated in 8086?	CO 2	BTL 1	Remembering
14	List the advantages of multiprocessor configurations.	CO 2	BTL 2	Understanding
15	What is the function of the BHE signal in 8086?	CO 2	BTL 2	Understanding
16	Mention the need for a co-processor.	CO 2	BTL 2	Understanding
17	Write the various bus allocation schemes in multiprocessor configurations.	CO 2	BTL 1	Remembering
18	How does the main processor distinguish its instructions from the co-processor instructions when it fetches the instructions from memory?	CO 2	BTL 2	Understanding
19	Differentiate the closely and loosely coupled configurations	CO 2	BTL 1	Remembering
20	How the synchronization is made between 8086 and its co-processor?	CO 2	BTL 1	Remembering
21	Give any four pin definitions for the minimum mode.	CO 2	BTL 2	Understanding
22	Draw the bus request and bus grant timings in minimum mode system.	CO 2	BTL 1	Remembering
23	Which pins of 8086 are used to indicate the type of transfer in minimum mode?	CO 2	BTL 2	Understanding
24	What is system bus architecture? Give generalized 8086 system bus architecture.	CO 2	BTL 2	Understanding
PART – B				
1	Draw the pin diagram of 8086 and Examine all the signals available in the 8086 processor. (16)	CO 2	BTL 4	Analyzing
2	Discuss about the 8086 based minimum mode system with a neat diagram. (16)	CO 2	BTL 4	Analyzing
3	Draw the timing diagram for Read and write cycle in minimum mode operation and explain. (16)	CO 2	BTL 3	Applying
4	Describe the maximum mode configuration of 8086 with a neat diagram. Mention the functions of various signals. (16)	CO 2	BTL 4	Analyzing
5	Explain the operations of I/O programming in detail. (16)	CO 2	BTL 3	Applying
6	Explain the closely coupled configuration of the multiprocessor system with a suitable diagram. (16)	CO 2	BTL 3	Applying
7	With a neat diagram, explain the architecture of 80286 with functional description of signals. (16)	CO 2	BTL 4	Analyzing

8	What are the problems that are to be considered in designing a multiprocessor system? (16)	CO 2	BTL 4	Analyzing
9	With the help of timing diagram, explain the Read and Write cycle in maximum mode operation of the 8086 microprocessor. (16)	CO 2	BTL 3	Applying
10	(i) Distinguish between loosely coupled and closely coupled multiprocessor systems. (8) (ii) Differentiate Maximum mode from minimum mode of 8086. (8)	CO 2	BTL 4	Analyzing
11	Explain how coprocessor is interfaced with CPU and synchronized. (16)	CO 2	BTL 3	Applying
12	With the help of a neat sketch, describe the interconnection of a coprocessor 8087 with 8086. (16)	CO 2	BTL 4	Analyzing
13	Discuss about the signals that are specific to minimum mode operation? (16)	CO 2	BTL 3	Applying
14	Examine the signals in interfacing the bus controller with 8086 microprocessor in maximum mode. (16)	CO 2	BTL 4	Analyzing
15	Enumerate I/O programming by its major input and output operation. (16)	CO 2	BTL 3	Applying
16	Explain multiprogramming by comparing with multiprocessing. (16)	CO 2	BTL 4	Analyzing
17	Explain the basic bus access control and arbitration schemes used in loosely coupled multiprocessor system. (16)	CO 2	BTL 3	Applying

UNIT III - PERIPHERALS AND INTERFACING				
Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface –- Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications.				
PART – A				
S.No.	Questions	CO	BT Level	Competence
1	State the advantage and disadvantage of parallel communication over serial communication.	CO 3	BTL 2	Understanding
2	Define the terms A/D & D/A convertor.	CO 3	BTL 1	Remembering
3	List the four display modes of 8279 keyboard and display controller	CO 3	BTL 1	Remembering
4	What are the applications of programmable interval timer?	CO 3	BTL 2	Understanding
5	Specify the different types of peripheral interfacing used in 8086.	CO 3	BTL 1	Remembering
6	Write the various modes of 8254 timer.	CO 3	BTL 1	Remembering
7	Classify the output modes used in 8279.	CO 3	BTL 1	Remembering
8	Formulate the frequency transmit clock (TxC) required by an 8251 in order to transmit data at 4800 Baud with a Baud rate factor of 16?	CO 3	BTL 2	Understanding
9	Point out the modes used by the DMA processor to transfer data.	CO 3	BTL 1	Remembering
10	What is meant by key bouncing?	CO 3	BTL 2	Understanding

11	How would you use the terminal count register?	CO 3	BTL 1	Remembering
12	Draw the format of Read back Command register of 8254.	CO 3	BTL 2	Understanding
13	Mention the applications of 8251 IC chip?	CO 3	BTL 1	Remembering
14	Find the necessity of handshake signals in mode-2 configurations of 8255.	CO 3	BTL 2	Understanding
15	Write the features of mode 1 used in 8255?	CO 3	BTL 1	Remembering
16	Configure the control word for the following specifications of 8255, In mode 0 operation, Ports A and B are input ports and C is an output port.	CO 3	BTL 2	Understanding
17	Define the value of ICW4 such that the 8259 is configured for use in an 8086 system, with normal EOI, buffered-mode master, and special fully nested-mode disabled.	CO 3	BTL 1	Remembering
18	Show the priority scheme for OCW_2 equals 67_{16}?	CO 3	BTL 1	Remembering
19	What is the purpose of control word used in 8255?	CO 3	BTL 2	Understanding
20	Identify the address lines and data lines for accessing 32K x 8 memory?	CO 3	BTL 1	Remembering
21	What is the need for interfacing?	CO 3	BTL 2	Understanding
22	Why program controlled I/O is unsuitable for high speed data transfer?	CO 3	BTL 1	Remembering
23	Identify the use of V_{ref} pin in the ADC?	CO 3	BTL 2	Understanding
24	What is the internal operating frequency of 8279? How can you derive it from any available clock signal?	CO 3	BTL 1	Remembering
	PART – B			
1	Explain the Functional diagram of Programmable Interrupt Controller in detail. (16)	CO 3	BTL 4	Analyzing
2	Describe the 8255 programmable peripheral interface and its operating modes. (16)	CO 3	BTL 3	Applying
3	(i) Illustrate how to interface an LCD display with an 8086 microprocessor. (8) (ii) Write a program to display a character using an LCD display. (8)	CO 3	BTL 4	Analyzing
4	With a neat diagram and explain the internal structure of keyboard and display controller. (16)	CO 3	BTL 3	Applying
5	How microprocessors are interfaced with I/O and memory? (16)	CO 3	BTL 4	Analyzing
6	Draw a circuit diagram to interface a keyboard and a seven segment LED using 8279. (16)	CO 3	BTL 3	Applying
7	Design a traffic light control system using 8086 microprocessor interface diagram and Write ALP for the same. (16)	CO 3	BTL 4	Analyzing
8	Discuss how 8257 is interfaced with 8086 and also explain the various register formats. (16)	CO 3	BTL 4	Analyzing
9	Describe the internal architectural diagram of the 8237 and explain how it functions as a DMA controller. (16)	CO 3	BTL 3	Applying
10	Point out the features and explain the operation of 8254 Programmable Interval Timer with diagram, and also explain the various modes of operation. (16)	CO 3	BTL 4	Analyzing

11	Design the steps for interfacing an alarm controller with an 8086 microprocessor with a diagram and explain in detail. (16)	CO 3	BTL 3	Applying
12	Draw the complete interfacing diagram for interfacing an 8-bit channel A/D Converter like ADC 0808/0809 to an 8086 CPU. Test a sample, one at a time from each channel of analog inputs and display it at a special display port & wait for 2 seconds for each channel. (16)	CO 3	BTL 4	Analyzing
13	Compare the different Modes of operation of 8253/8254 timer. (16)	CO 3	BTL 4	Analyzing
14	Draw a circuit diagram to interface 8251 with 8086 and explain. (16)	CO 3	BTL 3	Applying
15	Distinguish between Programmed I/O and Interrupt Driven I/O. (16)	CO 3	BTL 3	Applying
16	Draw and explain the interfacing scheme of 8255 and 8086 in memory mapped I/O. (16)	CO 3	BTL 4	Analyzing
17	Configure the master slave connection between two 8259 using 8086 processor with neat diagram. (16)	CO 3	BTL 4	Analyzing

UNIT IV - 8051 MICROCONTROLLER & INTERFACING			
Architecture of 8051 – Special Function Registers (SFRs) - Instruction set - Addressing modes – Timers - Serial Port – Interrupts - Assembly language programming. LCD & Keyboard Interfacing - Sensor Interfacing - External Memory Interfacing- Stepper Motor Interfacing.				
PART – A				
S.No.	**Questions**	**CO**	**BT Level**	**Competence**
1	What are the size of memory systems used in 8051 microcontroller?	CO 4	BTL 1	Remembering
2	Identify the different operand types used in 8051.	CO 4	BTL 1	Remembering
3	List the counters available in 8051.	CO 4	BTL 1	Remembering
4	How the selection of a particular register bank is done in 8051?	CO 4	BTL 2	Understanding
5	Which ports of 8051 are bit addressable?	CO 4	BTL 2	Understanding
6	Point out the advantage of bit addressability for 8051 ports?	CO 4	BTL 2	Understanding
7	Mention the significance of the GATE bit in the TMOD control register?	CO 4	BTL 1	Remembering
8	What happens in power down mode of 8051 Microcontroller?	CO 4	BTL 2	Understanding
9	Write the function of the SM2 bit present in the SCON register in 8051?	CO 4	BTL 1	Remembering
10	List the functions supported by SFR of 8051.	CO 4	BTL 2	Understanding
11	What is meant by PSW in 8051?	CO 4	BTL 1	Remembering
12	Outline the function of CJNE, DJNZ instruction.	CO 4	BTL 2	Understanding
13	Identify the port used as multifunction port and list the signals.	CO 4	BTL 1	Remembering
14	Give two example of bit manipulation instructions?	CO 4	BTL 2	Understanding
15	Distinguish between microprocessor & microcontroller.	CO 4	BTL 1	Remembering
16	What is the time duration for one state and one machine cycle if a 6 MHz crystal is connected to 8051?	CO 4	BTL 2	Understanding
17	Find out any two instructions which affects all flags of 8051	CO 4	BTL 1	Remembering

	Microcontroller?			
18	Define addressing mode and list the types.	CO 4	BTL 2	Understanding
19	Write the serial port interrupts of 8051.	CO 4	BTL 1	Remembering
20	For a 8051 Microcontroller system of 11.0592 MHz, find how long it takes to execute each of the following instructions: (a) DEC R3 (b) SJMP	CO 4	BTL 2	Understanding
21	Perform the following operations using bit addressable instructions: Start Timer 1, Stop Timer 0	CO 4	BTL 1	Remembering
22	A given 8051 chip has a speed of 16MHz. Generate the range of frequency that can be applied to the XTAL1 and XTAL2 pins?	CO 4	BTL 2	Understanding
23	Write a delay subroutine using RAM location 45H as the counter.	CO 4	BTL 1	Remembering
24	Draw the bit addressable format of TCON register.	CO 4	BTL 2	Understanding
	PART - B			
1	Discuss in detail about the instruction sets of 8051 microcontroller. (16)	CO 4	BTL 3	Applying
2	Illustrate the architectural features of 8051 microcontroller with necessary diagram. (16)	CO 4	BTL 4	Analyzing
3	Describe interrupts and interrupt programming with respect to 8051 microcontroller with neat diagram. (16)	CO 4	BTL 3	Applying
4	Analyze the internal RAM structure and SFR memory of 8051. (16)	CO 4	BTL 4	Analyzing
5	Explain in detail about arithmetic and control instruction set in 8051. (16)	CO 4	BTL 3	Applying
6	Draw the bit pattern of program status word of 8051 and explain the significance of each bit with examples. (16)	CO 4	BTL 4	Analyzing
7	Discuss in brief the various registers present in 8051 microcontroller. (16)	CO 4	BTL 3	Applying
8	Illustrate the internal memory organization of 8051 microcontroller. (16)	CO 4	BTL 3	Applying
9	Classify the different addressing modes in 8051 microcontroller with an example. (16)	CO 4	BTL 4	Analyzing
10	Write a program to calculate the average of an array of unsigned positive integers. The array starts from 31H, and the number of terms in the array is available in location 30H. Store the calculated average in the location 2FH. (16)	CO 4	BTL 4	Analyzing
11	Write short notes on TCON and SCON registers with necessary diagram. (16)	CO 4	BTL 4	Analyzing
12	Examine the function of 8051 microcontroller instructions for performing data transfer and logical operations with suitable examples. (16)	CO 4	BTL 3	Applying
13	Write an ALP in 8051 to convert a 16 bit binary number to ASCII. (16)	CO 4	BTL 3	Applying
14	Write the program to find square of a number using 8051 instruction set? (16)	CO 4	BTL 4	Analyzing
15	Summarize the various types and functions of I/O ports with necessary diagrams. (16)	CO 4	BTL 4	Analyzing
16	List the external hardware interrupts of 8051. Explain how they are activated. (16)	CO 4	BTL 3	Applying

17	Draw the register format of IE and IP registers of 8051 and explain in detail. (16)	CO 4	BTL 4	Analyzing

UNIT V- PIC MICROCONTROLLER & INTERFACING				
PIC Microcontroller - Features and Architecture, Classification of Instructions, PIC18 Programming in C, Timer, Serial Port and Interrupt, PIC18 Interfacing: ADC, DAC, and Sensor.				
PART – A				
S.No.	Questions	CO	BT	Competence
1	What are the key features of the PIC18 microcontroller?	CO 5	BTL 1	Remembering
2	Name the main blocks of the PIC18 architecture.	CO 5	BTL 2	Understanding
3	Define the role of the Harvard architecture in PIC microcontrollers.	CO 5	BTL 1	Remembering
4	What is the function of the program memory in the PIC18?	CO 5	BTL 2	Understanding
5	How are instructions classified in the PIC18 microcontroller?	CO 5	BTL 1	Remembering
6	What is the significance of the RISC instruction set in PIC18?	CO 5	BTL 1	Remembering
7	Name two instructions used for arithmetic operations in the PIC18 microcontroller.	CO 5	BTL 2	Understanding
8	Which instruction is used to clear a specific bit in a register?	CO 5	BTL 1	Remembering
9	Write the syntax for configuring a PORT pin as output in PIC18 C.	CO 5	BTL 2	Understanding
10	What is the purpose of the TRIS register in PIC18 programming?	CO 5	BTL 1	Remembering
11	How do you implement a delay in C programming for PIC18?	CO 5	BTL 1	Remembering
12	What header file is commonly used for PIC18 programming?	CO 5	BTL 2	Understanding
13	List two features of Timer0 in the PIC18 microcontroller.	CO 5	BTL 1	Remembering
14	What is the function of the TMR1 register in PIC18?	CO 5	BTL 1	Remembering
15	How is a Timer configured in C for the PIC18 microcontroller?	CO 5	BTL 1	Remembering
16	Mention one application of the Timer in microcontrollers.	CO 5	BTL 2	Understanding
17	What is the purpose of the UART module in the PIC18 microcontroller?	CO 5	BTL 2	Understanding
18	How does an interrupt differ from polling in microcontrollers?	CO 5	BTL 1	Remembering
19	Name the two types of interrupts in PIC18.	CO 5	BTL 1	Remembering
20	What is the role of the RCIF bit in the serial communication of PIC18?	CO 5	BTL 1	Remembering
21	What is the function of the ADC module in the PIC18 microcontroller?	CO 5	BTL 2	Understanding
22	How is the resolution of the ADC module in PIC18 defined?	CO 5	BTL 2	Understanding
23	Describe the role of a DAC in sensor interfacing.	CO 5	BTL 1	Remembering
24	Mention one application where sensor interfacing with PIC18 is useful.	CO 5	BTL 2	Understanding

	PART – B			
	PART – B			
1	Describe the architecture of the PIC18 microcontroller.	CO 5	BTL 3	Applying
2	Explain the classification of instructions in the PIC18 microcontroller. (16)	CO 5	BTL 4	Analyzing
3	Write a program in C to toggle an LED connected to PORTB of the PIC18 microcontroller. (16)	CO 5	BTL 4	Analyzing
4	Explain the working of Timers in the PIC18 microcontroller. (16)	CO 5	BTL 3	Applying
5	Explain how serial communication is implemented in the PIC18 microcontroller using the UART module. (16)	CO 5	BTL 4	Analyzing
6	Describe the interrupt handling process in the PIC18 microcontroller. (16)	CO 5	BTL 3	Applying
7	Explain the interfacing of an analog temperature sensor with the PIC18 microcontroller using the ADC module. (16)	CO 5	BTL 4	Analyzing
8	Discuss the implementation of DAC with the PIC18 microcontroller for generating analog signals. (16)	CO 5	BTL 3	Applying
9	Explain the steps for configuring and programming I/O ports in PIC18 microcontroller using C. (16)	CO 5	BTL 4	Analyzing
10	Explain the initialization process to interface an LCD with the PIC microcontroller. (16)	CO 5	BTL 3	Applying
11	Design and implement a C program for a PIC microcontroller to control a DC motor using PWM (16)	CO 5	BTL 4	Analyzing
12	Explain with neat flowchart for a PIC microcontroller to control a simple traffic light system. (16)	CO 5	BTL 3	Applying
13	Write a C program for a PIC microcontroller to implement a real-time clock (RTC) functionality. (16)	CO 5	BTL 4	Analyzing
14	Write short notes on following: (i) PIC Controller. (8) (ii) Sensor interfacing. (8)	CO 5	BTL 4	Analyzing
15	Explain the role of the microcontroller's GPIO (General Purpose Input/Output) pins. How are they configured, and what are the limitations? (16)	CO 5	BTL 4	Analyzing
16	Discuss the advantages and disadvantages of using the PIC18 microcontroller in embedded system design? (16)	CO 5	BTL 3	Applying
17	Describe the process of programming a PIC18 microcontroller. Include the tools and software needed for development. (16)	CO 5	BTL 4	Analyzing