Xi'an Jiaotong-Liverpool University

西交利物浦大学

MODULE CODE	EXAMINER	DEPARTMENT	TEL
CPT101	STEVEN GUAN	COMPUTING	1501

1st SEMESTER 2021/22 Open-Book FINAL EXAMINATIONS

BACHELOR DEGREE – Year 2

COMPUTER SYSTEMS

TIME ALLOWED: 2 Hours

INSTRUCTIONS TO CANDIDATES

1、 **This is an open-book exam. Please tick the integrity disclaimer *immediately after you initiate the online open-book exam* and complete the assessment independently and honestly.**

2、 **Total marks available are 100.**

3、 **Answer all questions. There is NO penalty for providing a wrong answer.**

4、 **Only answers in English are accepted.**

5、 **The duration is *2 hours*. Where there are any major problems preventing you from continuing the exam or submitting your answers in time, please do not hesitate to email the Module Examiner (steven.guan@xjtlu.edu.cn) or Assessment Team of Registry (assessment@xjtlu.edu.cn).**

Answer All Questions

Part I. Each of the following questions comprises 5 statements, for which you should select the most appropriate one. Attempt all questions. The exam mark is based on the overall number of correctly answered questions; incorrectly answered questions do not count against you. Each question is worth **2.5** marks.

1.(b) The closed, concentric rings on a hard disk are referred to as

□ a) grooves □ b) tracks □ c) sectors □ d) circles □ e) allocation tables

2.(a) What type of flip-flop allows us to copy data?

□ a) D flip-flop □ b) toggle flip-flop □ c) SR flip-flop

□ d) J flip-flop □ e) ST flip-flop

3.(e) What is the hexadecimal equivalent of **10101111**?

□ a) 9B □ b) DE □ c) AE □ d) 6E □ e) AF

4.(c) Executing more than one program concurrently by one (or more than one) user on one computer is known as

□ a) multicasting □ b) nesting □ c) multitasking

□ d) client-server computing □ e) interrupt processing

5.(d) Working with 7 bits, what is the two's complement representation of -17?

□ a) 1101001 □ b) 1111011 □ c) 0001011 □ d) 1101111 □ e) 1100101

6.(e) Which of the following is needed to generate executable code by combining object codes and library files together?

□ a) compiler □ b) interpreter □ c) assembler □ d) loader □ e) linker

d 7.(C) Comparing against CISC, which of the following is an advantage of adopting RISC philosophy in designing computers?

□ a) Instruction execution is slower R

□ b) instruction set is more friendly in supporting HLL constructs R

□ c) Instruction set implementation is more expensive

□ d) Instruction set implementation requires less chip area R

□ e) None of the above

8.(C) Which flag will be set after the execution of the instruction "CMP ESI, EDI" if the contents of ESI and EDI are equal?

□ a) D flag □ b) T flag □ c) Z flag □ d) S flag □ e) O flag

$2^0+2^1=1+2$

9.(b) Using two bytes only, what is the encoding of number 239 in BCD format?

□ a) 1000000100111011 □ b) 0000001000111001 □ c) 0000000110111001

□ d) 0010000001111001 □ e) 0010001001111001

10.(d) What registers are used to delimit a stack frame on the program stack during subroutine calls?

□ a) EAX,EBX □ b) ECX,EDX □ c) ESI,EDI □ d) EBP,ESP □ e) EAX,EDX

11.(C) Assume a block of 256 data bytes has to be stored. Which of the following solutions is NOT sufficient?

□ a) 8bit system with memory locations 0000 to 00FF

□ b) 24bit system with memory locations 0000 to 0055

□ c) 16bit system with memory locations 0000 to 007E

□ d) 32bit system with memory locations 0000 to 005E

□ e) 64bit system with memory locations 0000 to 0022

12. (C) Under 4-digit 10's complementary coding, 4157 represents

□ a) 157 □ b) -157 □ c) 4157 □ d) -4157 □ e) none of the above

13. (C) Assume there are 5 devices to be interconnected with 8 data lines (wires) plus 4 control lines (wires), how many wires are needed if point-to-point connection scheme is used? 4×5/2 = 10

□ a) 32 □ b) 64 □ c) 120 □ d) 180 10×12 □ e) None of the above

14. (a) Name 2 registers that are always used during each instruction execution.

□ a) IP,IR □ b) ECX,EDX □ c) EAX,EFLAG □ d) EBX,EBP

□ e) None of the above

15. (e) Which register is affected by the execution of "CMP EAX, EBX" instruction?

□ a) EAX □ b) EBX □ c) ECX □ d) ESI □ e) None of the above

16. (d) Which of the following is associated with labels during the assembly process?

□ a) constants □ b) data □ c) interrupts □ d) memory addresses □ e) stack

17. (e) Which of the following flags can affect the branching effect of "LOOPNE label" instruction?

□ a) A flag □ b) D flag □ c) O flag □ d) P flag □ e) Z flag

18. (b) Which of the following is used by Java interpreter as input?

□ a) micro codes □ b) byte codes □ c) source codes □ d) bit codes

□ e) macro codes

C 19. (e) Assume 16-bit sample size is used for audio with these specifications - stereo, sampling rate at 44.1KHz. How many Mbytes of data a CDrom can store by maximum if it can store up to 60 minutes of stereo audio without data compression? 302.

□ a) 127 □ b) 256 □ c) 605 □ d) 864 □ e) None of the above

20.(d) Disk cache is typically part of?

□ a) hard disk □ b) MMU □ c) cache control unit □ d) memory

□ e) None of the above

21.(d) Assume Process A needs 5 pages of memory. When the CPU runs the process, it requests data from each of the 5 pages with equal probability. Assume that the average time to read a word of data from main memory is 5 ns. Assume the average time to read/write a page from hard disk from/into main memory is 5000ns. Furthermore, assume that a page must be swapped out to make room for the incoming page. Assume no caching is used. What is the average access time to read a word of data if 1 page of process A is stored in main memory at one time while the content of the other 4 pages are on hard disk? $\frac{1}{5}\times 5 + \frac{4}{5}(5+5000\times 2)$

□ a) 5 ns □ b) 5005 ns □ c) 7505 ns □ d) 8005 ns □ e) 10005 ns

$=1+$

22.(b) What is the range of integers encoded with 7 bits using sign-and-magnitude representation ?

□ a) [-31, 31] □ b) [-63, 63] □ c) [-255, 255] □ d) [-127, 127]

□ e) [-1023, 1023]

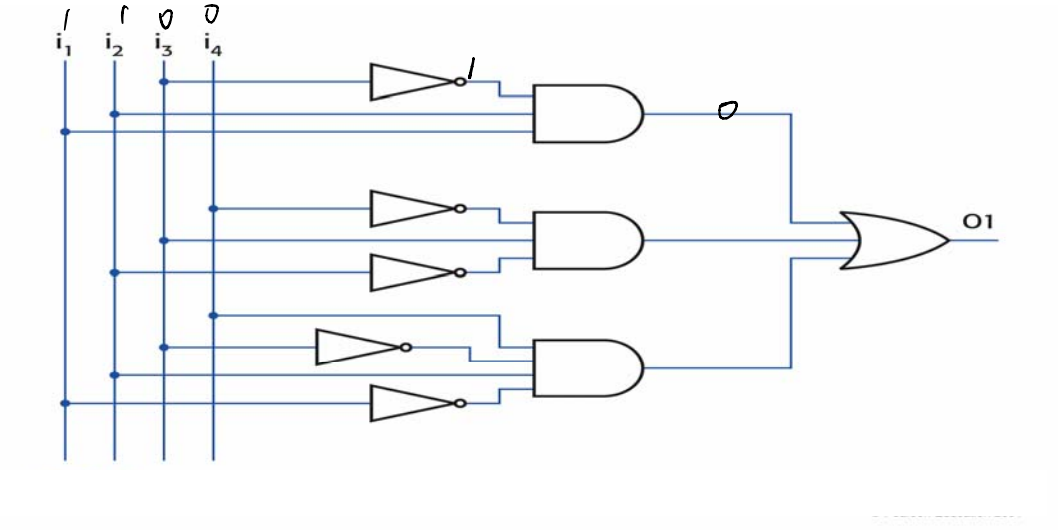
23.(d) In one's complement system, what is the integer that the binary value 10011111 represents?

□ a) 63 □ b) 85 □ c) -79 □ d) -96 □ e) -15

0 1 1 0 0 0 0 1 $2^0+2^5+2^6$

$1+32+64$

24. Which of the following value for input (*i1,i2,i3,i4*) gives the output O1 value as 1 in the following Boolean circuit?



□ a) (1,1,0,0)

□ b) (1,0,0,1)

□ c) (1,1,1,1)

□ d) (1,0,0,0)

□ e) (0,0,0,1)

25. If four integer parameters were pushed onto stack when calling '*scanf*' in inline assembly, how would you adjust the value of register 'esp' when returning from '*scanf*'?

□ a) add ESP, 8 □ b) add ESP, 16 □ c) sub ESP, 8

□ d) sub ESP, 16 □ e) No action required

26. Consider the following variation of complement-based coding scheme. Assume the following weighting scheme is used for encoding (or decoding) of 8-bit binary numbers:

128 -64 32 -16 8 4 2 -1

Which of the following integer is not representable by such a coding scheme?

□ a) -101 □ b) -1 □ c) 66 □ d) 0 □ e) 137

27.(d) When a subroutine is about to finish its job and before it returns to the caller, which of the following does not occur?

□ a) all local variables are popped out of the stack
□ b) the previous EBP address is popped from the top of the stack and restored in EBP
□ c) parameters are cleaned up in the stack
□ d) the return address is popped off the stack
□ e) none of the above

28.(e) When passing parameters from our inline assembly code to a C I/O library function such as '*scanf*', the number of parameters is passed …

□ a) by value □ b) by reference □ c) by register □ d) by cache
□ e) none of the above

29.(b) The following binary number in 32 bits represents a floating point number based upon the IEEE 754 standard in single precision.

0|10000010|00010000000000000000000

What is the floating point number being encoded?

□ a) -1205 □ b) 8.5 □ c) -785.25 □ d) 61256 □ e) 8008

30.(d) Given the following C library function '*scanf*' statement to be simulated via inline assembly code,

how many parameters need to be pushed to the program stack before "call scanf"?

scanf("%d %d %c ", a, b, c);

Here we assume a, b are integers while c is a character.

□ a) 0 □ b) 1 □ c) 2 □ d) 3 □ e) 4

Part II. Answer all of the following.

31. Drag-and-drop (for online test) or write the sequence number (for on-site test) of the assembly code to form a program where 7 numbers in an array are added and stored in the ebx register. Note that your sequence must absolutely match the line numbers to the left-most column of the table otherwise 3 marks will be deducted for each incorrect match. The answer for the first line has been provided. Complete the rest. (**15 marks**)

	Correct Sequence	**Pick From Here**	
Line 1	4	1	myLoop: add ebx, [eax]
Line 2	5	2	loop myLoop
Line 3	6	3	jmp myLoop
Line 4	1	4	mov ebx, 0
Line 5	8	5	mov ecx, 7
Line 6	2	6	mov eax, array
		7	myLoop: add ebx, eax
		8	add eax, 4
		9	mov ecx, 6

32. Fill in the missing places with the correct arguments/instructions for a program that sort integers in ascending order. (**10 marks**)

```
    lea     esi, intArray
L1:
    mov     eax, [esi]
    cmp     [esi+4] eax
    jge     L2
    cmp     eax, [esi+4]
    mov     [esi], eax
L2:
    add     esi, 4
    jmp     L1
```

END OF PAPER