UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, APRIL/MAY 2019

COURSE NO: EL382

COURSE NAME: MICROPROCESSORS AND DIGITAL CONTROL SYSTEMS

CLASS: ELIII **TIME**: 3 HOURS

Name**:** _____Index Number: _____

SECTION A (60 MARKS)

Carefully read each question and then circle the letter that bears the correct answer

1. The 8051 microprocessor has _____ 16-bit counter/timers.
   a. 1
   b. 2
   c. 3
   d. 4
2. A microcontroller at least should consist of____.
   a. RAM, ROM, I/O devices, serial and parallel ports and timers
   b. CPU, RAM, I/O devices, serial and parallel ports and timers
   c. CPU, RAM, ROM, I/O devices, serial and parallel ports and times
   d. CPU, ROM, I/O devices and timers
3. The 8051 microprocessor can handle _____ interrupt sources.
   a. 3
   b. 4
   c. 5
   d. 6
4. The total external data memory that can be interfaced to the 8051 is____.
   a. 32 Kbytes
   b. 64 Kbytes
   c. 128 Kbytes
   d. 256 Kbytes
5. Which of the following instructions will load the value 35H into the high byte of timer 0?
   a. MOV TH0, #35H
   b. MOV TH0, 35H
   c. MOV T0, #35H
   d. MOV T0, 35H
6. Bit-addressable memory locations are___.
   a. 10H through 1FH
   b. 20H through 2FH
   c. 30H through 3FH
   d. 40H through 4FH
7. Which of the following commands will copy the contents of RAM whose address is in register 0 to port 1?
   a. MOV @P1, R0
   b. MOV@R0, P1
   c. MOV P1, @R0
   d. MOV P1, R0
8. What will be the result if the following instructions are executed?

   MOV A, # FFH

   MOV B, #1AH

   DIV AB
   a. A=09H
   b. A=09H and B=21H
   c. A=21H and B=09H
   d. A=21H

9. How is the status of the carry, auxiliary carry and parity flag affected in the following instructions?

   MOV A, #88H

   ADD A, #93H

   a. CY=0, AC=0, P=0
   b. CY=1, AC=0, P=1
   c. CY=1, AC=0, P=0
   d. CY=1, AC=1, P=1

10. How are the bits of the register PSW affected if we select Bank1 of 8051?

    a. PSW.5=0 and PSW.4=1
    b. PSW.3=1 and PSW.4=1
    c. PSW.2=0 and PSW.3=1
    d. PSW.3=1 and PSW.4=0

11. What will be the result if the following instructions are executed?

    MOV A, #0BH

    XRL A, #2CH

    a. 00001000
    b. 00101111
    c. 11011010
    d. 00100111

12. If we push data onto the stack then the stack pointer___.
    a. Increases with every push
    b. Decreases with every push
    c. Jumps with every push
    d. Increases with every pop

13. DJNZ R0, label is how many bit instructions?

    a. 2
    b. 3
    c. 1
    d. 5

14. JZ, JNZ, DJNZ, JC, JNC instructions monitor the bits of which register?

    a. DPTR
    b. A
    c. B
    d. PSW

15. When the CALL instruction is executed the topmost element of stack comes out to be___.
    a. Address where stack pointer starts
    b. Address of the CALL instruction
    c. Address next to the CALL instruction
    d. Next address of the stack pointer

16. What is the time taken by one machine cycle if crystal frequency is 40MHz?

    a. 0.60 micro seconds
    b. 0.025 micro seconds
    c. 0.30 micro seconds
    d. 0.33 milli seconds

17. Find the number of times the following loop will be executed:

```
        MOV R4, #300
BACK:   MOV R1, #300
HERE:   DJNZ R1, HERE
        DJNZ R4, BACK
END
```

a. 600
b. 300
c. 90000
d. 600000

18. Do the two instructions mean the same?

i.
```
BACK: DEC R0
      JZ BACK
```

ii.
```
BACK: DJNZ R0, BACK
```

a. Yes
b. No
c. Cannot be determined
d. None of the mentioned

19. To initialise any port as an output port what value is to be given to it?

a. 0xFF
b. A port is by default an output port
c. 0x01
d. 0x01

20. When we multiply two numbers the destination address must always be___.

a. Some immediate data
b. Accumulator
c. Any register
d. Accumulator and B register

21. In 8-bit signed number operations, OV flag is set to 1 if:

a. A carry is generated from D7 bit
b. A carry is generated from D7 or D3 bit
c. A carry is generated from D3 bit
d. A carry is generated from D7 or D6 bit

22. Which OPCODE have no effect on the flags of PSW?

a. ANL
b. ADD
c. SUBB
d. CPL

23. What is the maximum delay that can be generated with the crystal frequency of 20MHz?

a. 2.97 milli seconds
b. 3.28 milli seconds
c. 0.04 seconds
d. 0.6 micro seconds

24. Auto reload mode is allowed in which mode of the timer?

a. Mode 0
b. Mode 2
c. Mode 1
d. Mode 3

25. If Timer 0 is to be used as a counter, then at what particular pin clock pulse need to be applied?

a. P3.3
b. P3.5
c. P3.4
d. P3.6

26. TF1, TR1, TF0, TR0 bits are of which register?

a. TMOD
b. TCON
c. SCON
d. SMOD

27. When an interrupt is enabled, then where does the pointer moves immediately after this interrupt has occurred?

a. To the first instruction of ISR
b. To the next instruction which is to be executed
c. To the interrupt vector table
d. To the end of the program

28. After RETI instruction is executed then the pointer will move to which location in the program?

a. Next interrupt of the interrupt vector table
b. Next instruction after the RETI in the memory
c. Next instruction of the program after the IE instruction
d. None of the mentioned

29. Which register is used to make the pulse a level or an edge triggered pulse?

a. TCON
b. IE
c. IPR
d. SCON

30. Name the architecture and the instruction set for 8051 microcontroller?

a. Van- Neumann Architecture with CISC Instruction Set
b. Van- Neumann Architecture with RISC Instruction Set
c. Harvard Architecture with CISC Instruction Set
d. Harvard Architecture with RISC Instruction Set

31. Which pin provides a reset option in 8051?

a. Pin 1
b. Pin 8
c. Pin 11
d. Pin 9

32. . Timer 0 is a _____ bit register.

a. 32-bit
b. 8-bit
c. 16-bit
d. 10-bit

33. Number of pins in 8051 microcontroller is _____ package.

a. 40 pin with LLC
b. 60 pin with QFP
c. 40 pin with DIP
d. 60 pin with QFP

34. PSEN stands for ___.

a. Program Select Enable
b. Peripheral Store Enable
c. Program Store Enable
d. Peripheral Select Enable

35. What kind of instructions usually affect the program counter?

a. Call and Jump
b. Call and Return
c. Push and Pop
d. Return and Jump

36. What is the default value of stack once after the system undergoes the reset condition?

a. 07H
b. 09H
c. 08H
d. 00H

37. Which flags represent the least significant bit (LSB) and most significant bit (MSB) of Program Status Word (PSW) respectively?

a. Parity Flag and Auxiliary Carry Flag
b. Parity Flag and Carry Flag
c. Carry Flag and Auxiliary Carry Flag
d. Carry Flag and Overflow Flag

38. Which among the below stated registers does not belong to the category of special function registers?

a. TCON and TMOD
b. P0 and P1
c. TH0 and TL0
d. SP and PC

39. Which commands are used for addressing the external data and associated codes respectively by data pointer?

a. MOVX and MOVC
b. MOVY and MOVB
c. MOVZ and MOVA
d. MOVC and MOVY

40. How does the processor respond to an occurrence of the interrupt?

a. By Interrupt Service Subroutine
b. By Interrupt Status Subroutine
c. By Interrupt Structure Subroutine
d. By Interrupt System Subroutine

41. Which special function register play a vital role in the timer/counter mode selection process by allocating the bits in it?

a. TMOD
b. TCON
c. SCON
d. PCON

42. All the following are examples of assembler directives except___.

a. EQU
b. RET
c. ORG
d. DBIT

43. The instructions that changes the sequence of execution of a program is called___.

a. Conditional instructions
b. Logical instructions
c. Program control instructions
d. Data transfer instructions

44. The number of LEDs that can be connected to a port of 8051 if all are expected to glow simultaneously is___.

a. 6
b. 8
c. 10
d. 12

45. The 7 seven segment LED display are of ___types.

a. Common anode
b. Common cathode
c. Common gate
d. Both a and b

46. To write number 5 using the seven-segment display connected to port 1, if port 1 is initially off and P1.7 is not used then port 1 must be assigned with following binary command:

a. 00010010b
b. 01101101b
c. 10010010b
d. 11101101b

47. In assembly language programming comments always begin with___.

a. #
b. %
c. @
d. //

48. The symbolic address for an instruction is called___.

a. OPCODE
b. LABEL
c. Addressing mode
d. OPERAND

49. If the content of the accumulator is 2CH and that of the carry is 0, what will be the content of the accumulator after RRC A instruction is executed.

a. 5AH
b. 96H
c. 16H
d. 116H

50. The following are examples of conditional jump except___.

a. CJNZ
b. JBC
c. SJMP
d. DJNZ

51. The basic characteristics that differentiate microprocessors are the following except___.

a. Instruction set
b. Bandwidth
c. Clock speed
d. Cost

52. XCH instruction must use register ___ as the destination operand.

a. A
b. B
c. DPTR
d. R0

53. SJMP can cause the instruction to jump to___ of the program space.

a. 256 bytes
b. 64 Kbytes
c. 2 Kbytes
d. 127 bytes

54. Which instruction is used to exchange the lower order nibble of the Accumulator with the lower order nibble of RAM location indirectly addressed by Register R3?

a. XCH A, @R3
b. XCHD A, @R3
c. XCHD A, R3
d. XCH A, R3

55. The following program will receive data from port 1, determine whether bit 2 is high and then send the number FFH to port 4:

```
READ: MOV A, P1
      ANL A, #2H
      CJNE A, #02H, READ
      MOV P4, #FFH
```

a. True b. False

56. Device pins XTAL1 and XTAL2 for the 8051 are used for connections to an external oscillator or crystal.

a. True b. False

57. This program code will be executed continuously:

```
STAT: MOV A, #01H
      JNZ STAT
```

a. True b. False

58. The control bus is unidirectional.

a. True b. False

59. Von Neumann bottleneck increases the data transfer rate between the CPU and memory.

a. True b. False

60. The Interrupt Enable (IE) is a special function register at address A8H.

a. True b. False

SECTION B [40 MARKS]

Answer all questions

Q1.

a. Draw the block diagram of a basic digital control system indicating all the signals at the various input the output blocks.

b. Explain the following devices used in digital control system.

   i. Sampler

   ii. Zero order hold.

c. For the closed-loop system shown in Figure 1 with a zero-order hold, Find and plot the output response when a unit step input is applied. Assume that T = 1 s.

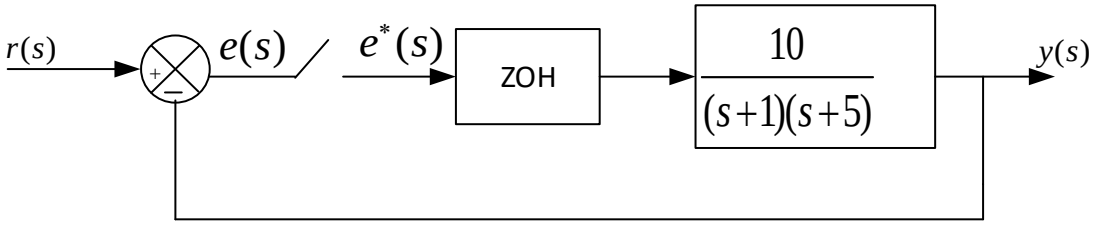

Figure 1

d. The open-loop transfer function of a sampled data system is given by the expression:

$$G(Z) = \frac{1}{z^3 - 3.1z^2 + 3.1z - 1.1}$$

The closed-loop system is formed by using a unity gain feedback. Determine the stability of the system using;

   i. Jury's test.

   ii. The Routh-Hurwitz criterion.

Q2.

a. State four (4) main differences between a microprocessor and a microcontroller.

b. Draw the architecture block diagram of the 8051 microcontroller.

c. Write an assembly language program to generate a 10 kHz square wave on P0.2 using timer interrupts.

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