| Giảng viên: | Ngày: 04-12-2023 | Duyệt đề bởi: | Ngày: 04-12-2023 |
|---|---|---|---|
| *(Chữ kí - Họ và Tên)* | | *(Chữ kí - Họ và Tên)* | |
| TS. Lê Trọng Nhân | | PGS. TS. Phạm Quốc Cường | |

| Bách Khoa University (BKU)<br>**Computer Science - Engineering** | **MID TERM EXAM** | Học Kì/Năm | 2 | 2023 |
|---|---|---|---|---|
| | | Ngày | 00-00-2023 | |
| | Môn học | Microcontroller - Microprocessor | | |
| | Mã MH | CO3009 | | |
| | Thời gian | 60 phút | Mã Đề | 2013 |

**Notes:** Papers for references are allowed!!
**Student ID:**
**Student Name:**

Section 1. Choose the correct answer of each question.

1. [L.O.1] An output signal having frequency is 10Hz and the duty cycle is 20%. How long the signal stays in HIGH level in a cycle?
   (a) 100ms
   (b) 20ms
   (c) 80ms
   (d) None of the above

2. [L.O.1] What is the data structure used to return from the interrupt?
   (a) stack
   (b) list
   (c) queue
   (d) tree

3. [L.O.1] How many bits resolution needed to address a value ranging from 0 to 4095?
   (a) 10
   (b) 11
   (c) 12
   (d) 13

4. [L.O.2] Timer is configured with prescaler is 799 and counter is 9. What counter value in next tick?
   (a) 10
   (b) 8
   (c) 0
   (d) 799

5. [L.O.1] In order to scan 4 different 7-segment LEDs with 50Hz, what is the time period between 2 consecutive 7-segment LEDs?
   (a) 20ms
   (b) 10ms
   (c) 5ms
   (d) 4ms

6. [L.O.1] In order to scan 4 different 7-segment LEDs with 50Hz, what is the best timer interrupt period?
   (a) 50ms
   (b) 20ms
   (c) 10ms
   (d) 5ms

7. [L.O.2] It is assumed that a software timer is implemented based on Timer2 interrupt of the STM32. The cycle of the interrupt is 10ms. What is the maximum error of the software timer when setTimer() is used?
   (a) 1ms
   (b) 10ms
   (c) 5ms
   (d) Cannot determine

8. [L.O.3] In this DFA, what is the cycle of the LED? It is assumed that setTimer(T) is equal to T*10(ms).

```
#define INIT 1
#define LED_ON 2
#define LED_OFF 3
#define T_on 200
#define T_off 300

int led_status = INIT;

void led_fsm(){
  switch(led_status){
    case INIT:
        led_status = LED_ON;
        setTimer(T_on);
        break;
    case LED_ON:
        led_on();
        if(timer_flag == 1){
            led_status = LED_OFF;
            setTimer(T_off);
        }
        break;
    case LED_OFF:
        led_off();
        if(timer_flag == 1){
            led_status = LED_ON;
            setTimer(T_on);
        }
        break;
    default:
        break;
  }
}
```

(a) 2s
(b) 3s
(c) 5s
(d) None of the above

9. [L.O.1] An output signal having frequency is 10Hz and the duty cycle is 80%. How long the signal stays in LOW level in a cycle?

(a) 100ms
(b) 20ms
(c) 80ms
(d) None of the above

10. [L.O.1] In order to update the second, minute and hour of a digital clock, what is the best frequency for this task?

(a) 1Hz
(b) 24Hz
(c) 60Hz
(d) None of the above

11. [L.O.3] Following the source code below, what is the duty cycle of the output from PA5?

```
int main(){
  while (1){
    if(timer_flag_1 == 1){
      timer_flag_1 = 0;
      setTimer1(100);// 100ms
      HAL_GPIO_Toggle(GPIOA,
          GPIO_PIN_5);
    }
  }
}
```

(a) 25%
(b) 50%
(c) 100%
(d) None of the above

12. [L.O.2] Assumes MCU System Clock is 80MHz, if you want to configure timer interrupt with 1 miliseconds. Which set below is correct?

(a) Prescaler: 79, Counter: 1000
(b) Prescaler: 79, Counter: 10001
(c) Prescaler: 79, Counter: 999
(d) Prescaler: 799, Counter: 100

13. [L.O.1] What GPIO stands for?

(a) Global Purpose Input/Output
(b) General Purpose Input/Output
(c) Global Port Input/Output
(d) General Port Input/Output

14. [L.O.2] It is assumed that the HCLK is 8MHz, what is the period of the timer interrupt if the prescaler is 799 and the counter is 9?

(a) 1ms
(b) 10ms
(c) 100ms
(d) None of the above

15. [L.O.1] What is correct about an Open Drain pin of the STM32?

    (a) It is an output pin
    (b) It is an input pin
    (c) It is an ADC pin
    (d) It is an PWM pin

16. [L.O.1] In order to control an LED, what is the best configuration for the STM32 pin?

    (a) GPIO
    (b) Input Pull Up
    (c) Push Pull
    (d) Open Drained

17. [L.O.1] What (is) are the advantage(s) of the MCU compared to MPU?

    (a) Processor chip is extremely small
    (b) Cost and size of the system is less
    (c) Real-time processing
    (d) All of the above

18. [L.O.1] An output signal having frequency is 10Hz and the duty cycle is 20%. What is the cycle of this signal?

    (a) 1s
    (b) 100s
    (c) 100ms
    (d) None of the above

19. [L.O.1] Which is the duty cycle of signal when it's have 3 seconds in HIGH and 2 seconds in LOW?

    (a) 10%
    (b) 30%
    (c) 60%
    (d) 80%

20. [L.O.3] What is the duty cycle of the signal on PA5?

```
int main(){
  while (1){
    HAL_GPIO_TogglePin(GPIOA,
       GPIO_PIN_5);
    HAL_Delay(100);
  }
}
```

    (a) 25%
    (b) 50%
    (c) 100%
    (d) None of the above

21. [L.O.1] It is assumed that the switching time between 2 consecutive columns in a matrix LED (having 8 columns) is 1ms. What is the scanning frequency of the matrix LED?

    (a) 100Hz
    (b) 125Hz
    (c) 800Hz
    (d) None of the above

22. [L.O.2] What is true about the RESET interrupt?

    (a) It is a non maskable interrupt
    (b) It is a maskable interrupt
    (c) It is an exception interrupt
    (d) All of the above are correct

23. [L.O.3] What is the output frequency of the signal on PA5?

```
int main(){
  while (1){
    HAL_GPIO_TogglePin(GPIOA,
       GPIO_PIN_5);
    HAL_Delay(100);
  }
}
```

    (a) 1Hz
    (b) 5Hz
    (c) 10Hz
    (d) 20Hz

24. [L.O.2] What is true about the Timer interrupt?

    (a) It is a non maskable interrupt
    (b) It is a maskable interrupt
    (c) It is an exception interrupt
    (d) All of the above are correct

25. [L.O.1] What is the default input value of a button having a pull-up resistor?

    (a) HIGH
    (b) LOW
    (c) Depending on the resistor
    (d) Cannot determine

26. [L.O.3] In this DFA, how long (in second) the LED stays ON during its period? It is assumed that setTimer(T) is equal to T*10(ms).

```
#define INIT 1
#define LED_ON 2
#define LED_OFF 3
#define T_on 200
#define T_off 300

int led_status = INIT;

void led_fsm(){
  switch(led_status){
    case INIT:
        led_status = LED_ON;
        led_on();
        setTimer(T_on);
        break;
    case LED_ON:
        if(timer_flag == 1){
            led_status = LED_OFF;
            setTimer(T_off);
            led_off();
        }
        break;
    case LED_OFF:
        if(timer_flag == 1){
            led_status = LED_ON;
            setTimer(T_on);
            led_on();
        }
        break;
    default:
        break;
  }
}
```

(a) 2s

(b) 3s

(c) LED is always ON

(d) LED is always OFF

27. [L.O.2] The interrupt controller in STM32 is:

(a) IC - Interrupt Controller

(b) IVT - Interrupt Vector Table

(c) NVIC - Nested Vector Interrupt Controller

(d) RETI - Return from Interrupt

28. [L.O.3] Where is the best place to invoke a state machine function, which is used to control an LED?

(a) Before the while(1)

(b) In the while(1)

(c) In the timer ISR

(d) All are correct

29. [L.O.1] Which of the following file extension that is loaded in a microcontroller for executing any instruction?

(a) .c

(b) .cpp

(c) .hex

(d) All of the above

# Answer Key for Exam A

Section 1. Choose the correct answer of each question.

1. (b)
2. (a)
3. (c)
4. (c)
5. (c)
6. (d)
7. 
8. (c)
9. (b)
10. 
11. (b)
12. (c)
13. (a)
14. (a)
15. (a)
16. (c)
17. (d)
18. (c)
19. (c)
20. (b)
21. (b)
22. (a)
23. (b)
24. (b)
25. (a)
26. (a)
27. (c)
28. (b)
29. (c)