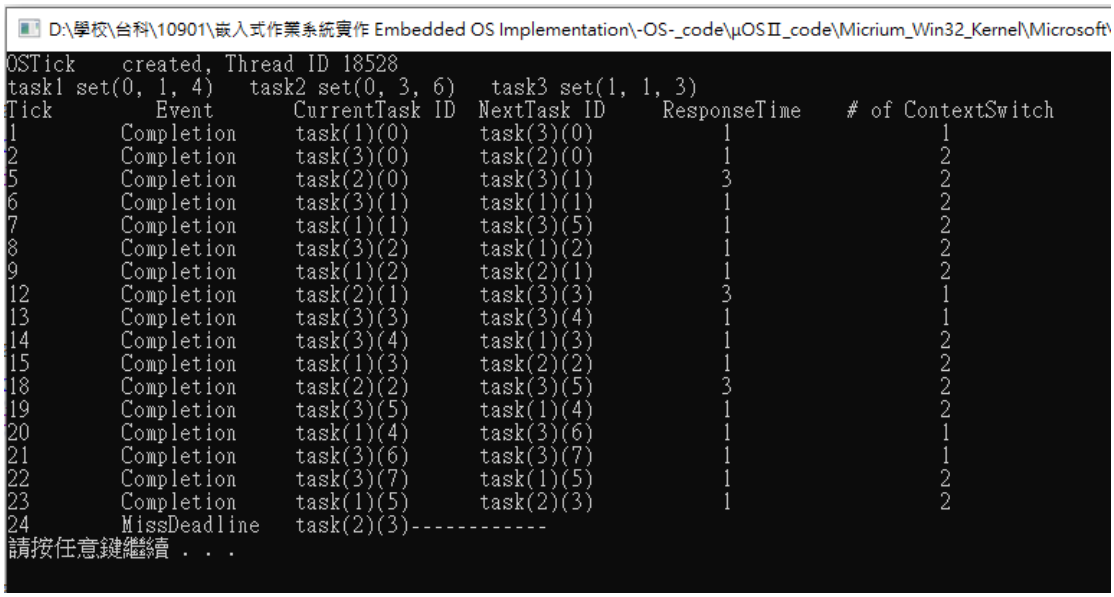
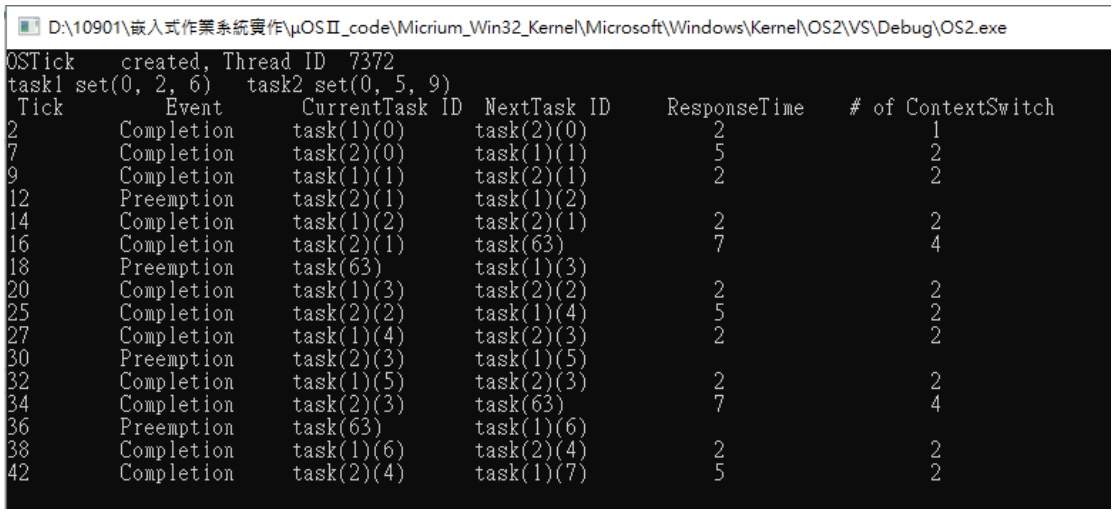
[PART I] EDF Scheduler Implementation.

1.The screenshot results (with the given format) of two task sets. (Tick 0 to tick 40 or the tick when a task missing the deadline) (10%)

(1)Task set 1 = {τ1 (0, 2, 6), τ2 (0, 5, 9)}



(2)Task set 2 = {τ1 (0, 1, 4), τ2 (0, 3, 6), τ3 (1, 1, 3)}



2. Implement and describe how to handle the deadline missing situation under EDF. (10%)

```
//處理missdeadline
ptcb = OSTCBList;
while (ptcb != (OS_TCB*)0) {
    TimeTask* point_t = ptcb->OSTCBExtPtr;
    if (point_t != 0 && OSTimeGet() > point_t->period_time * (point_t->executive_count + 1)) {
        printf("%-6d", OSTimeGet());
        printf("%-14s", "MissDeadline");
        printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");
        printf("-------------------------\n");
        system("pause");
    }
    ptcb = ptcb->OSTCBNext;
}
```

3. A report that describes your implementation, including scheduling results of two task sets, modified functions, data structure, etc. (please **ATTACH** the screenshot of the code and **MARK** the modified part) (40%)

(1) Task set 1 = {τ1 (0, 2, 6), τ2 (0, 5, 9)}

```
#define TASK_STACKSIZE       2048
#define TASK1_PRIORITY       1
#define TASK2_PRIORITY       2
#define TASK1_ID             1
#define TASK2_ID             2

static  OS_STK  StartupTaskStk[APP_CFG_STARTUP_TASK_STK_SIZE];
static  OS_STK  Task1_STK[TASK_STACKSIZE];
static  OS_STK  Task2_STK[TASK_STACKSIZE];

static  void  StartupTask(void* p_arg);
static  void  task1(void* p_arg);
static  void  task2(void* p_arg);


TimeTask task1_set = { 0, 2, 6 };      //set : {start time, work time, period time}
TimeTask task2_set = { 0, 5, 9 };      //set : {start time, work time, period time}
```

(2)Task set 2 = {τ1 (0, 1, 4), τ2 (0, 3, 6), τ3 (1, 1, 3)}

```
#define TASK_STACKSIZE       2048
#define TASK1_PRIORITY       2
#define TASK2_PRIORITY       3
#define TASK3_PRIORITY       1
#define TASK1_ID             1
#define TASK2_ID             2
#define TASK3_ID             3

static  OS_STK  StartupTaskStk[APP_CFG_STARTUP_TASK_STK_SIZE];
static  OS_STK  Task1_STK[TASK_STACKSIZE];
static  OS_STK  Task2_STK[TASK_STACKSIZE];
static  OS_STK  Task3_STK[TASK_STACKSIZE];

static  void  StartupTask(void* p_arg);
static  void  task1(void* p_arg);
static  void  task2(void* p_arg);
static  void  task3(void* p_arg);

TimeTask task1_set = { 0, 1, 4 };      //set : {start time, work time, period time}
TimeTask task2_set = { 0, 3, 6 };      //set : {start time, work time, period time}
TimeTask task3_set = { 1, 1, 3 };      //set : {start time, work time, period time}
```

```c
void task1(void *p_arg) {
    (void)p_arg;
    while (1) {
        ;
    }
}

void task2(void* p_arg) {
    (void)p_arg;
    while (1) {
        ;
    }
}

void task3(void* p_arg) {
    (void)p_arg;
    while (1) {
        ;
    }
}
```

```c
OSTaskCreateExt(
    task1,
    &task1_set,
    &Task1_STK[TASK_STACKSIZE - 1],
    TASK1_PRIORITY,
    TASK1_ID,
    &Task1_STK[0],
    TASK_STACKSIZE,
    &task1_set,
    (OS_TASK_OPT_STK_CHK | OS_TASK_OPT_STK_CLR));

OSTaskCreateExt(
    task2,
    &task2_set,
    &Task2_STK[TASK_STACKSIZE - 1],
    TASK2_PRIORITY,
    TASK2_ID,
    &Task2_STK[0],
    TASK_STACKSIZE,
    &task2_set,
    (OS_TASK_OPT_STK_CHK | OS_TASK_OPT_STK_CLR));


OSTaskCreateExt(
    task3,
    &task3_set,
    &Task3_STK[TASK_STACKSIZE - 1],
    TASK3_PRIORITY,
    TASK3_ID,
    &Task3_STK[0],
    TASK_STACKSIZE,
    &task3_set,
    (OS_TASK_OPT_STK_CHK | OS_TASK_OPT_STK_CLR));
```

```c
/*
*********************************************************************************************************************
*                                                    project2                                                       *
*********************************************************************************************************************
*/
int min_task = 0;
int t11 = 8 - (OSTimeGet() % 8);    //計算task1與deadline的距離
int t12 = 10 - (OSTimeGet() % 10); //計算task2與deadline的距離
int t13 = 20 - (OSTimeGet() % 20); //計算task3與deadline的距離
if (t11 < t12 && t11 < t13 ) { min_task = 1; }//如果task1最接近deadline
if (t12 < t11 && t12 < t13 ) { min_task = 2; }//如果task2最接近deadline
if (t13 < t12 && t13 < t11 ) { min_task = 3; }//如果task3最接近deadline
int responsetime = 0;
int context_switch = 0;
OS_TCB* ptcb;
if (OSPrioHighRdy != 0) {                                       //程式開始執行
    ptcb = OSTCBPrioTbl[OSPrioHighRdy];
    TimeTask* point_t = ptcb->OSTCBExtPtr;                      //指向自定義數據以進行TCB擴展的指針

    if (point_t != 0) {                                         //如果不是idle task
        //如果是completion_task
        if (OSTimeGet() - point_t->current_start_time == point_t->work_time + point_t->preemptive_time) {
            printf("%-6d", OSTimeGet());
            printf("%-14s", "Completion");
            a = 0;
            if (OSTimeGet() % point_t->period_time == 0) {
                responsetime = point_t->period_time;                //計算respondtime
            }
            else {
                responsetime = OSTimeGet() % point_t->period_time - point_t->start_time; //計算respondtime
            }
            printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");  //print 現在的 task ID
            c = 0;
            //Delay current task
            if (point_t->period_time * (point_t->executive_count + 1) - OSTimeGet() + point_t->start_time != 0) {
                OS_ENTER_CRITICAL();
                y = ptcb->OSTCBY;                                   //Delay current task
                OSRdyTbl[y] &= (OS_PRIO)~ptcb->OSTCBBitX;
                OS_TRACE_TASK_SUSPENDED(ptcb);
                if (OSRdyTbl[y] == 0u) {
                    OSRdyGrp &= (OS_PRIO)~ptcb->OSTCBBitY;
                }
```

```
                if (OSRdyTbl[y] == 0u) {
                    OSRdyGrp &= (OS_PRIO)~ptcb->OSTCBBitY;
                }
                ptcb->OSTCBDly = point_t->period_time * (point_t->executive_count + 1) - OSTimeGet() + point_t->start_time;            //Load ticks in TCB
                OS_TRACE_TASK_DLY(point_t->period_time * (point_t->executive_count + 1) - OSTimeGet() + point_t->start_time);
                OS_EXIT_CRITICAL();
                y = OSUnMapTbl[OSRdyGrp];
            }
            point_t->executive_count++;
            if (OSPrioHighRdy != (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]))
                point_t->context_switch++;  //計算conextswitch
            context_switch = point_t->context_switch;//計算conextswitch
            point_t->context_switch = 0;        //contextswitch歸零
            point_t->preemptive_time = 0;       //preemptivetime歸零
        }
        //OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]])
        //如果是preemption_task
        if (OSTimeGet() - point_t->current_start_time < point_t->work_time + point_t->preemptive_time &&
            OSPrioHighRdy != (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]) ) {
            if (min_task == ptcb->OSTCBId) {
                printf("%-6d%-14s%-5s%d%-2s%d%-9s%-5s%d%-2s%d%-15s%-20d%d\n", OSTimeGet() + 1, "Completion", "task(", 2, ")(", 0, ")", "task(", 1, ")(", 4, ")", 3, 2);
            }
            else {
            printf("%-6d", OSTimeGet());
            printf("%-14s", "Preemption");
            a = 1;
            printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");//print 現在的 task ID
            c = 0;
            }
            point_t->context_switch++;  //計算conextswitch
            if (point_t->preemptive_time > 0) {point_t->preemptive_time = OSTimeGet() - point_t->preemptive_time;}//更新preemptivetime
            else {point_t->preemptive_time = OSTimeGet(); }//更新preemptivetime
        }
    }
    //如果是idle task
    else if (point_t == 0) {
        printf("%-6d", OSTimeGet());
        printf("%-14s", "Preemption");
        printf("%-5s%d%-11s", "task(", OSPrioHighRdy, ")");//print idle task
    }
```

```
    if (OSPrioHighRdy != (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]) || (point_t->context_switch == 0 && point_t->executive_count != 0)) {
        OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]);
        ptcb = OSTCBPrioTbl[OSPrioHighRdy];
        point_t = ptcb->OSTCBExtPtr;
        if (point_t != 0) {
            if (a == 0) { if (c == 0) { printf("%-5s%d%-2s%d%-15s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")"); c = 1; } }
            else { printf("%-5s%d%-2s%d%-15s\n", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")"); }
            if (OSPrioHighRdy != OSPrioCur) {point_t->context_switch++;}//計算conextswitch
            if (point_t->preemptive_time == 0) {point_t->current_start_time = OSTimeGet();}//儲存task start time
            if (point_t->preemptive_time > 0) {point_t->preemptive_time = OSTimeGet() - point_t->preemptive_time;}//更新preemptive time
        }

        //如果下一個task是idel task
        else if (point_t == 0) {
            printf("%-5s%d%-17s", "task(", OSPrioHighRdy, ")");//print task(63)
        }
        //print responsetime and context switch
        if (responsetime > 0) {
            printf("%-20d%d\n", responsetime, context_switch);
            responsetime = 0;
        }
        //處理missdeadline
        ptcb = OSTCBList;
        while (ptcb != (OS_TCB*)0) {
            TimeTask* point_t = ptcb->OSTCBExtPtr;
            if (point_t != 0 && OSTimeGet() > point_t->period_time * (point_t->executive_count + 1)) {
                printf("%-6d", OSTimeGet());
                printf("%-14s", "MissDeadline");
                printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");
                printf("-------------------------\n");
                system("pause");
            }
            ptcb = ptcb->OSTCBNext;
        }

    }
}
```

```
//initizal setting
else if (OSPrioHighRdy == 0) {
    OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]);

    OS_TCB* ptcb;
    ptcb = OSTCBList;
    while (ptcb != (OS_TCB*)0) {
        TimeTask* point_t = ptcb->OSTCBExtPtr;

        if (point_t != 0 && point_t->start_time > 0u) {                          // 0 means no delay!
            OS_ENTER_CRITICAL();
            y = ptcb->OSTCBY;                                                    //Delay current task
            OSRdyTbl[y] &= (OS_PRIO)~ptcb->OSTCBBitX;
            OS_TRACE_TASK_SUSPENDED(ptcb);
            if (OSRdyTbl[y] == 0u) {
                OSRdyGrp &= (OS_PRIO)~ptcb->OSTCBBitY;
            }
            ptcb->OSTCBDly = point_t->start_time;                //Load ticks in TCB
            OS_TRACE_TASK_DLY(point_t->start_time);
            OS_EXIT_CRITICAL();
        }
        ptcb = ptcb->OSTCBNext;
    }
    y = OSUnMapTbl[OSRdyGrp];
    OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]);

}

/*
*********************************************************************************************************************************************
*                                                                project2                                                                   *
*********************************************************************************************************************************************
*/
```

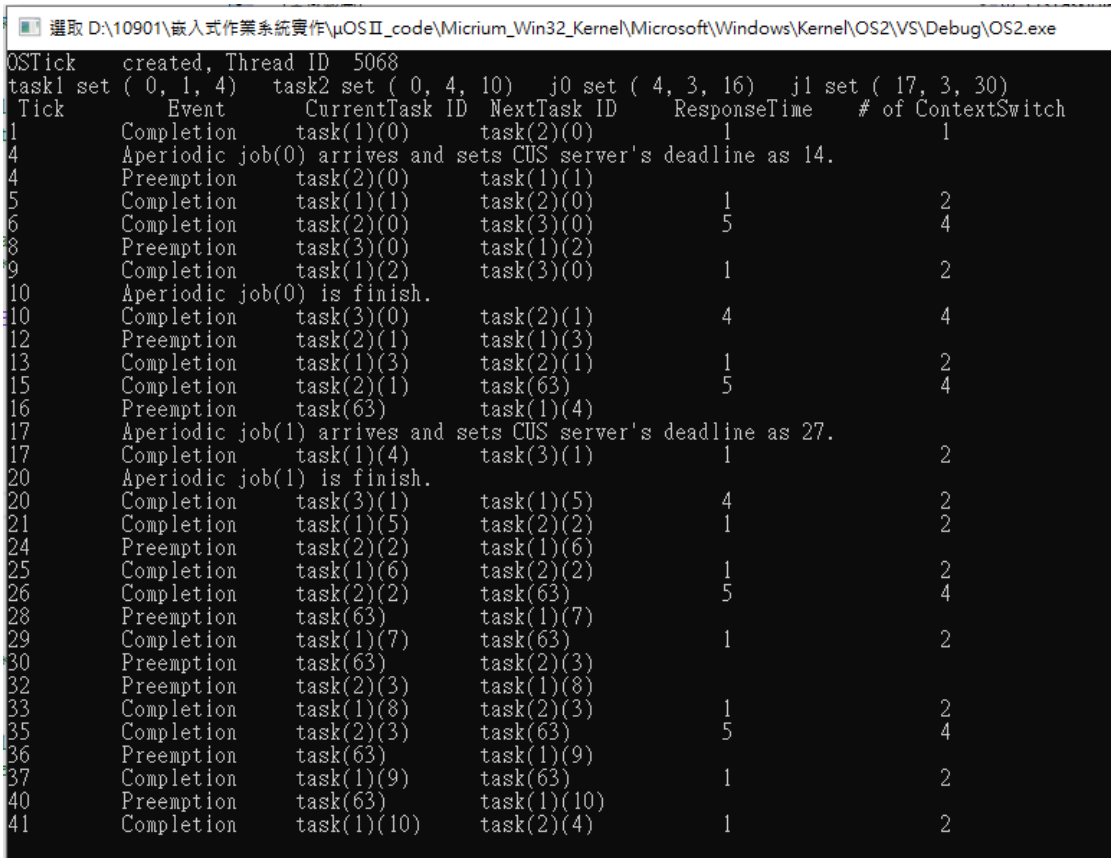
[PART II] CUS Scheduler Implementation [40%]

1. The screenshot results (with the given format) of two task sets. (Tick 0 to tick 40 or the tick when a task missing the deadline). (10%)

========== Task Set 1 ==========

Periodic Task Set1 = {τ1 (0, 1, 4), τ2 (0, 4, 10), τ3_ServerSize (0.3)}

Aperiodic Jobs Set1 = {j0 (4, 3, 16), j1 (17, 3, 30)}



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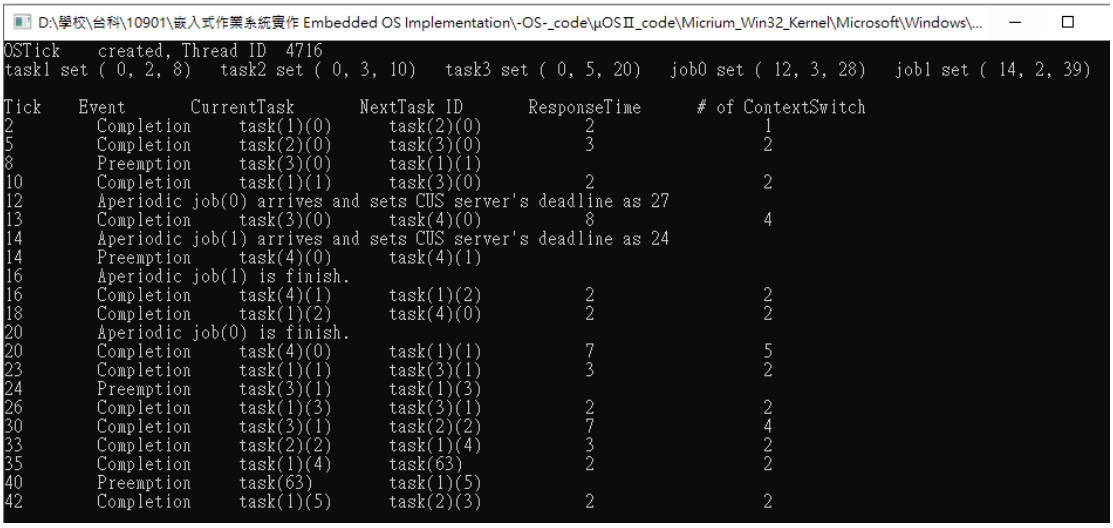
```
OSTick    created, Thread ID  5068
task1 set ( 0, 1, 4)   task2 set ( 0, 4, 10)   j0 set ( 4, 3, 16)   j1 set ( 17, 3, 30)
 Tick         Event       CurrentTask ID  NextTask ID     ResponseTime    # of ContextSwitch
1         Completion     task(1)(0)      task(2)(0)          1                 1
4         Aperiodic job(0) arrives and sets CUS server's deadline as 14.
4         Preemption     task(2)(0)      task(1)(1)
5         Completion     task(1)(1)      task(2)(0)          1                 2
6         Completion     task(2)(0)      task(3)(0)          5                 4
8         Preemption     task(3)(0)      task(1)(2)
9         Completion     task(1)(2)      task(3)(0)          1                 2
10        Aperiodic job(0) is finish.
10        Completion     task(3)(0)      task(2)(1)          4                 4
12        Preemption     task(2)(1)      task(1)(3)
13        Completion     task(1)(3)      task(2)(1)          1                 2
15        Completion     task(2)(1)      task(63)            5                 4
16        Preemption     task(63)        task(1)(4)
17        Aperiodic job(1) arrives and sets CUS server's deadline as 27.
17        Completion     task(1)(4)      task(3)(1)          1                 2
20        Aperiodic job(1) is finish.
20        Completion     task(3)(1)      task(1)(5)          4                 2
21        Completion     task(1)(5)      task(2)(2)          1                 2
24        Preemption     task(2)(2)      task(1)(6)
25        Completion     task(1)(6)      task(2)(2)          1                 2
26        Completion     task(2)(2)      task(63)            5                 4
28        Preemption     task(63)        task(1)(7)
29        Completion     task(1)(7)      task(63)            1                 2
30        Preemption     task(63)        task(2)(3)
32        Preemption     task(2)(3)      task(1)(8)
33        Completion     task(1)(8)      task(2)(3)          1                 2
35        Completion     task(2)(3)      task(63)            5                 4
36        Preemption     task(63)        task(1)(9)
37        Completion     task(1)(9)      task(63)            1                 2
40        Preemption     task(63)        task(1)(10)
41        Completion     task(1)(10)     task(2)(4)          1                 2
```

========== Task Set 2 ==========

Periodic Task Set2 = {τ1 (0, 2, 8), τ2 (0, 3, 10), τ3 (0, 5, 20), τ4_ServerSize (0.2)}

Aperiodic Jobs Set2 = {j0 (12, 3, 28), j1 (14, 2, 39)}



2. A report that describes your implementation, including scheduling results of two task sets, modified functions, data structure, etc. (please **ATTACH** the screenshot of the code and **MARK** the modified part). (30%)

========== **Task Set 1** ==========

Periodic Task Set1 = {τ1 (0, 1, 4), τ2 (0, 4, 10), τ3_ServerSize (0.3)}

Aperiodic Jobs Set1 = {j0 (4, 3, 16), j1 (17, 3, 30)}

```
#define TASK_STACKSIZE       2048
#define TASK1_PRIORITY       1
#define TASK2_PRIORITY       2

#define TASK1_ID             1
#define TASK2_ID             2

static  OS_STK  StartupTaskStk[APP_CFG_STARTUP_TASK_STK_SIZE];
static  OS_STK  Task1_STK[TASK_STACKSIZE];
static  OS_STK  Task2_STK[TASK_STACKSIZE];

static  void  StartupTask(void* p_arg);
static  void  task1(void* p_arg);
static  void  task2(void* p_arg);

TimeTask task1_set = { 0, 1, 4 };      //set : {start time, work time, period time}
TimeTask task2_set = { 0, 4, 10 };      //set : {start time, work time, period time}
```

========== **Task Set 2** ==========

Periodic Task Set2 = {τ1 (0, 2, 8), τ2 (0, 3, 10), τ3 (0, 5, 20), τ4_ServerSize (0.2)}

Aperiodic Jobs Set2 = {j0 (12, 3, 28), j1 (14, 2, 39)}

```
#define TASK_STACKSIZE       2048
#define TASK1_PRIORITY       1
#define TASK2_PRIORITY       2
#define TASK3_PRIORITY       3
#define TASK1_ID             1
#define TASK2_ID             2
#define TASK3_ID             3
static  OS_STK  StartupTaskStk[APP_CFG_STARTUP_TASK_STK_SIZE];
static  OS_STK  Task1_STK[TASK_STACKSIZE];
static  OS_STK  Task2_STK[TASK_STACKSIZE];
static  OS_STK  Task3_STK[TASK_STACKSIZE];
static  void  StartupTask(void* p_arg);
static  void  task1(void* p_arg);
static  void  task2(void* p_arg);
static  void  task3(void* p_arg);
TimeTask task1_set = { 0, 2, 8 };      //set : {start time, work time, period time}
TimeTask task2_set = { 0, 3, 10 };      //set : {start time, work time, period time}
TimeTask task3_set = { 0, 5, 20 };      //set : {start time, work time, period time}
```

```
void task1(void *p_arg) {
    (void)p_arg;
    while (1) {
        ;
    }
}

void task2(void* p_arg) {
    (void)p_arg;
    while (1) {
        ;
    }
}

void task3(void* p_arg) {
    (void)p_arg;
    while (1) {
        ;
    }
}
```

```
OSTaskCreateExt(
    task1,
    &task1_set,
    &Task1_STK[TASK_STACKSIZE - 1],
    TASK1_PRIORITY,
    TASK1_ID,
    &Task1_STK[0],
    TASK_STACKSIZE,
    &task1_set,
    (OS_TASK_OPT_STK_CHK | OS_TASK_OPT_STK_CLR));

OSTaskCreateExt(
    task2,
    &task2_set,
    &Task2_STK[TASK_STACKSIZE - 1],
    TASK2_PRIORITY,
    TASK2_ID,
    &Task2_STK[0],
    TASK_STACKSIZE,
    &task2_set,
    (OS_TASK_OPT_STK_CHK | OS_TASK_OPT_STK_CLR));


OSTaskCreateExt(
    task3,
    &task3_set,
    &Task3_STK[TASK_STACKSIZE - 1],
    TASK3_PRIORITY,
    TASK3_ID,
    &Task3_STK[0],
    TASK_STACKSIZE,
    &task3_set,
    (OS_TASK_OPT_STK_CHK | OS_TASK_OPT_STK_CLR));
```

```
/*
*********************************************************************************************************
*                                                project2                                               *
*********************************************************************************************************
*/

int jo_1[3] = { 12,3,28 };
int j1_1[3] = { 14,2,39 };
int t4 = 2; int d1 = 0; int d0 = 0;
d0 = jo_1[0] + (jo_1[1]*10 / t4);
d1 = j1_1[0] + (j1_1[1]*10 / t4);
int j0_in = 0; int j1_in = 0;

if (OSTimeGet() == jo_1[0]) {
    printf("%-5d Aperiodic job(0) arrives and sets CUS server's deadline as %d\n",OSTimeGet(),d0);
}
else if (OSTimeGet() == j1_1[0]) {
    printf("%-5d Aperiodic job(1) arrives and sets CUS server's deadline as %d\n", OSTimeGet(), d1);
}



int min_task = 0;
int t11 = 8 - (OSTimeGet() % 8);    //計算task1與deadline的距離
int t12 = 10 - (OSTimeGet() % 10); //計算task2與deadline的距離
int t13 = 20 - (OSTimeGet() % 20); //計算task3與deadline的距離
if (t11 < t12 && t11 < t13 ) { min_task = 1; }//如果task1最接近deadline
if (t12 < t11 && t12 < t13 ) { min_task = 2; }//如果task2最接近deadline
if (t13 < t12 && t13 < t11 ) { min_task = 3; }//如果task3最接近deadline
//printf("%d \t %d \n",OSTimeGet(),min_task);


    /*
    *********************************************************************************************************
    *                                                project2                                               *
    *********************************************************************************************************
    */

    int jo_1[3] = { 12,3,28 };
    int j1_1[3] = { 14,2,39 };
    int t4 = 2; int d1 = 0; int d0 = 0;
    d0 = jo_1[0] + (jo_1[1]*10 / t4);
    d1 = j1_1[0] + (j1_1[1]*10 / t4);
    int j0_in = 0; int j1_in = 0;

    if (OSTimeGet() == jo_1[0]) {
        printf("%-5d Aperiodic job(0) arrives and sets CUS server's deadline as %d\n",OSTimeGet(),d0);
    }
    else if (OSTimeGet() == j1_1[0]) {
        printf("%-5d Aperiodic job(1) arrives and sets CUS server's deadline as %d\n", OSTimeGet(), d1);
    }
    int responsetime = 0;
    int context_switch = 0;

    OS_TCB* ptcb;

    if (OSPrioHighRdy != 0) {                                           //程式開始執行
        ptcb = OSTCBPrioTbl[OSPrioHighRdy];
        TimeTask* point_t = ptcb->OSTCBExtPtr;                          //指向自定義數據以進行TCB擴展的指針

        if (point_t != 0) {                                             //如果不是idle task
            //如果是completion_task
            if (OSTimeGet() - point_t->current_start_time == point_t->work_time + point_t->preemptive_time) {
```

```
if (point_t != 0) {                                          //如果不是idle task
    //如果是completion_task
    if (OSTimeGet() - point_t->current_start_time == point_t->work_time + point_t->preemptive_time) {
        printf("%-6d", OSTimeGet());
        printf("%-14s", "Completion");
        a = 0;
        if (OSTimeGet() % point_t->period_time == 0) {
            responsetime = point_t->period_time;                 //計算respondtime
        }
        else {
            responsetime = OSTimeGet() % point_t->period_time - point_t->start_time; //計算respondtime
        }
        if (ptcb->OSTCBId == 5 && j1_in != 0) { j1_in = 1; printf("%-5s%d%-2s%d%-9s", "task(", 4, ")(", 1, ")"); } //如果task ID 為5的時候 ，更改print task ID為4
        if (ptcb->OSTCBId == 4 && j0_in != 0) { j0_in = 1; printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");}
        else { printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")"); } //print 現在的 task ID
        //printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");
        c = 0;
        //Delay current task
        if (point_t->period_time * (point_t->executive_count + 1) - OSTimeGet() + point_t->start_time != 0) {
            //OSTimeDly_EUF(ptcb->OSTCBId, ptcb->OSTCBDly, 8, 10, 20, 28, 39);
            OS_ENTER_CRITICAL();
            y = ptcb->OSTCBY;                                    //Delay current task
            OSRdyTbl[y] &= (OS_PRIO)~ptcb->OSTCBBitX;
            OS_TRACE_TASK_SUSPENDED(ptcb);
            if (OSRdyTbl[y] == 0u) {
                OSRdyGrp &= (OS_PRIO)~ptcb->OSTCBBitY;
            }
            ptcb->OSTCBDly = point_t->period_time * (point_t->executive_count + 1) - OSTimeGet() + point_t->start_time;            //Load ticks in TCB
            OS_TRACE_TASK_DLY(point_t->period_time * (point_t->executive_count + 1) - OSTimeGet() + point_t->start_time);
            OS_EXIT_CRITICAL();
            y = OSUnMapTbl[OSRdyGrp];
        }
        point_t->executive_count++;
        if (OSPrioHighRdy != (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]))
            point_t->context_switch++;  //計算conextswitch
        context_switch = point_t->context_switch;//計算conextswitch
        point_t->context_switch = 0;        //contextswitch歸零
        point_t->preemptive_time = 0;       //preemptivetime歸零
    }
    //OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]])
    //如果是preemption_task
    if (OSTimeGet() - point_t->current_start_time < point_t->work_time + point_t->preemptive_time &&
        OSPrioHighRdy != (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]) ) {
        if (min_task == ptcb->OSTCBId) {
            printf("%-6d%-14s%-5s%d%-2s%d%-9s%-5s%d%-2s%d%-15s%-20d%d\n", OSTimeGet() + 1, "Completion", "task(", 2, ")(", 0, ")", "task(", 1, ")(", 4, ")", 3, 2);
        }
        else {
        printf("%-6d", OSTimeGet());
        printf("%-14s", "Preemption");
        a = 1;
        printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");//print 現在的 task ID
        c = 0;
        }
        point_t->context_switch++;  //計算conextswitch
        if (point_t->preemptive_time > 0) {point_t->preemptive_time = OSTimeGet() - point_t->preemptive_time;}//更新preemptivetime
        else {point_t->preemptive_time = OSTimeGet(); }//更新preemptivetime


    }
}
```

```
    //如果是idle task
    else if (point_t == 0) {
        if (OSTimeGet() != 14 && OSTimeGet() != 16 && OSTimeGet() != 20) {
            printf("%-6d", OSTimeGet());
            printf("%-14s", "Preemption");
            printf("%-5s%d%-11s", "task(", OSPrioHighRdy, ")");//print idle task
        }
        else {
            if (OSTimeGet() == 14) { printf("12    Preemption    task(2)(1)        task(1)(2)\n"); }
            if (OSTimeGet() == 16) { printf("16    Completion    task(4)(1)        task(1)(2)              2                   2\n"); }
            if (OSTimeGet() == 20) { printf("20    Completion    task(4)(0)        task(1)(1)              7                   5\n"); }
        }
    }

    if (OSPrioHighRdy != (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]) || (point_t->context_switch == 0 && point_t->executive_count != 0)) {
        OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]);
        ptcb = OSTCBPrioTbl[OSPrioHighRdy];
        point_t = ptcb->OSTCBExtPtr;
        if (point_t != 0) {
            if (a == 0) { if (c == 0) { printf("%-5s%d%-2s%d%-15s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")"); c = 1; } }
            else { printf("%-5s%d%-2s%d%-15s\n", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")"); }
            if (OSPrioHighRdy != OSPrioCur) {point_t->context_switch++;}//計算conextswitch
            if (point_t->preemptive_time == 0) {point_t->current_start_time = OSTimeGet();}//儲存task start time
            if (point_t->preemptive_time > 0) {point_t->preemptive_time = OSTimeGet() - point_t->preemptive_time;}//更新preemptive time
        }

        //如果下一個task是idel task
        else if (point_t == 0) {
            printf("%-5s%d%-17s", "task(", OSPrioHighRdy, ")");//print task(63)
        }
        //print responsetime and context switch
        if (responsetime > 0) {
            printf("%-20d%d\n", responsetime, context_switch);
            responsetime = 0;
        }
```

```
            //print responsetime and context switch
            if (responsetime > 0) {
                printf("%-20d%d\n", responsetime, context_switch);
                responsetime = 0;
            }
            else {
                printf("\n");
            }
            //處理missdeadline
            ptcb = OSTCBList;
            while (ptcb != (OS_TCB*)0) {
                TimeTask* point_t = ptcb->OSTCBExtPtr;
                if (point_t != 0 && OSTimeGet() > point_t->period_time * (point_t->executive_count + 1)) {
                    printf("%-6d", OSTimeGet());
                    printf("%-14s", "MissDeadline");
                    printf("%-5s%d%-2s%d%-9s", "task(", ptcb->OSTCBId, ")(", point_t->executive_count, ")");
                    printf("-------------------------\n");
                    system("pause");
                }
                ptcb = ptcb->OSTCBNext;
            }

        }
    }
```

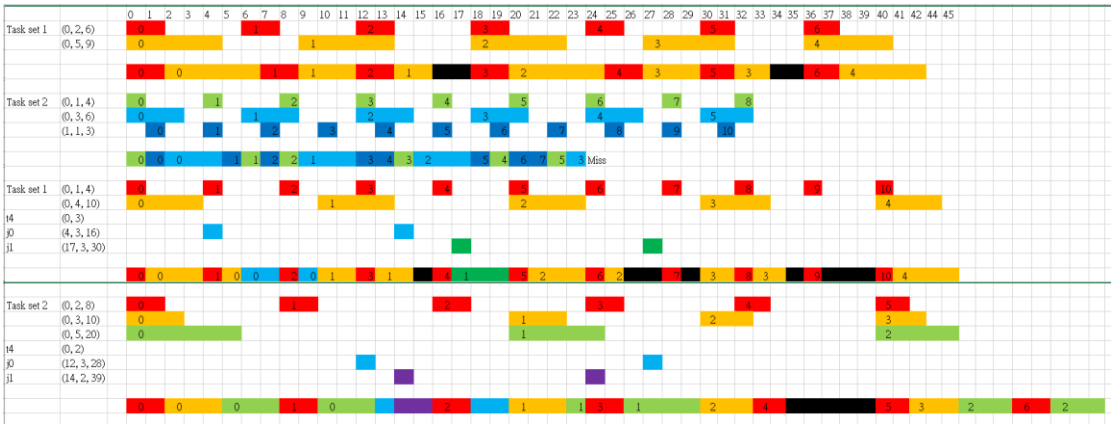
```
    //initizal setting
    else if (OSPrioHighRdy == 0) {
        OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]);

        OS_TCB* ptcb;
        ptcb = OSTCBList;
        while (ptcb != (OS_TCB*)0) {
            TimeTask* point_t = ptcb->OSTCBExtPtr;

            if (point_t != 0 && point_t->start_time > 0u) {                          // 0 means no delay!
                OS_ENTER_CRITICAL();
                y = ptcb->OSTCBY;                                   //Delay current task
                OSRdyTbl[y] &= (OS_PRIO)~ptcb->OSTCBBitX;
                OS_TRACE_TASK_SUSPENDED(ptcb);
                if (OSRdyTbl[y] == 0u) {
                    OSRdyGrp &= (OS_PRIO)~ptcb->OSTCBBitY;
                }
                ptcb->OSTCBDly = point_t->start_time;              //Load ticks in TCB
                OS_TRACE_TASK_DLY(point_t->start_time);
                OS_EXIT_CRITICAL();
            }
            ptcb = ptcb->OSTCBNext;
        }
        y = OSUnMapTbl[OSRdyGrp];
        OSPrioHighRdy = (INT8U)((y << 3u) + OSUnMapTbl[OSRdyTbl[y]]);

    }
    /*
    ********************************************************************************************************************************
    *                                                        project2                                                              *
    ********************************************************************************************************************************
    */
```

```
/*
********************************************************************************************************************************
*                                                        project2                                                              *
********************************************************************************************************************************
*/
typedef struct TimeTask {
    int start_time;             //作業開始時間
    int work_time;              //工作工作時間
    int period_time;            //任務期
    int context_switch;         //任務完成後，清除上下文開關
    int executive_count;        //任務執行時間
    int current_start_time;     //作業的實際開始時間
    int preemptive_time;        //搶占任務時間
}TimeTask;
/*
********************************************************************************************************************************
*                                                        project2                                                              *
********************************************************************************************************************************
*/
```


Task set 1 (0, 2, 6)
(0, 5, 9)
Task set 2 (0, 1, 4)
(0, 3, 6)
(1, 1, 3)
Miss
Task set 1 (0, 1, 4)
(0, 4, 10)
t4 (0, 3)
j0 (4, 3, 16)
j1 (17, 3, 30)
Task set 2 (0, 2, 8)
(0, 3, 10)
(0, 5, 20)
t4 (0, 2)
j0 (12, 3, 28)
j1 (14, 2, 39)