Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION
DECEMBER 2020/JANUARY 2021
SUBJECT: ADVANCED EMBEDDED SYSTEM DESIGN (ECE - 4001)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Justify the need of an operating system in the embedded system. Describe the services provided by the OS.

1B. Write the process data structure. What is the role of process control block in OS?

1C. Draw the process states with time line diagram for the given process trace. The starting address of Process A, Process B and Process C are 5000, 8000 and 12000 respectively. The dispatcher starting address is 100.

1	5000	27	12004
2	5001	28	12005
3	5002	----------Time-out	
4	5003	29	100
5	5004	30	101
6	5005	31	102
----------Time-out		32	103
7	100	33	104
8	101	34	105
9	102	35	5006
10	103	36	5007
11	104	37	5008
12	105	38	5009
13	8000	39	5010
14	8001	40	5011
15	8002	----------Time-out	
16	8003	41	100
----------I/O request		42	101
17	100	43	102
18	101	44	103
19	102	45	104
20	103	46	105
21	104	47	12006
22	105	48	12007
23	12000	49	12008
24	12001	50	12009
25	12002	51	12010
26	12003	52	12011
		----------Time-out	

(4+3+3)

2A. What are the benefits of RTOS over super loop? Explain.

2B. What is the role of suspend state in process state diagram? Write the difference between ready suspend and blocked suspend. Give the characteristics of suspended state.

2C. Explain multithreading. With the help of a diagram differentiate user level thread, kernel level thread.

(4+3+3)

3A. Write the difference between os_dly_wait () and os_itv_wait() functions ? Write an RTX code to blink the LED for every second using os_itv_ ( ) function.

3B. What is Thumb-2 instruction? What are the advantages of Thumb-2 instructions in Cortex-M3 processor over traditional ARM?

3C. Explain the given function. If we substitute the data as 0XFFFFFFFF in line 5, what is change we are going to have?

```
Line 1:  int main(void) {
Line 2:                  UART0_Init();
Line 3:                  LPC_PINCON->PINSEL0 &= 0xFF0000FF;
Line 4:                  LPC_PINCON->PINSEL1 &= 0xFFF3FFFF;
Line 5:                  LPC_GPIO0->FIODIR |= 0x02000FF0;
Line 6:                  LPC_GPIO0->FIOSET = 0x00000FF0;
Line 7:                os_sys_init_prio (init_task, 10);          }
```

(4+3+3)

4A. Complete the **Table 4A** using the data given for the 5 processes. Draw the timing diagram with comparative analysis for all the scheduling.

4B. Write an RTX code for LPC1768 using an event function to multiply the 2 numbers in one task and display the product in another task by changing the priority.

(5+5)

5A. Write an RTX code for LPC1768 using semaphore to display the message "RELAY" and "LED" while relay and LED are operating.

5B. What is dead lock? For the given instruction sequence given in Fig. 5B, explain deadlock with the help of a diagram.

5C. Explain in brief the AMBA based system.

(4+3+3)

TABLE 4A

Process	A	B	C	D	E
Arrival time	0	2	3	5	7
Service time (Ts)	3	2	4	4	3
FCFS					
Finish Time					
TAT (Tt)					
Tt/ Ts					
RR with q=2					
Finish Time					
TAT (Tt)					
Tt/ Ts					
SPN					
Finish Time					
TAT (Tt)					
Tt/ Ts					

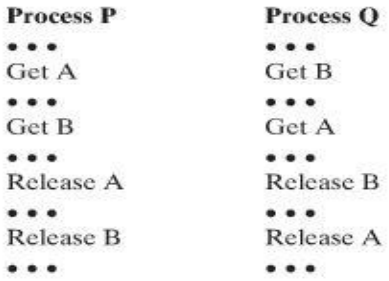

Fig. 5B