


Name:	 UPES <small>UNIVERSITY WITH A PURPOSE</small>
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, Dec 2020

Course: Real Time Operating System Internal
Program: B. Tech. CSE IoT-SC
Course Code: CSTI 4001

Semester: III
Time 03 hrs.
Max. Marks: 100

SECTION A

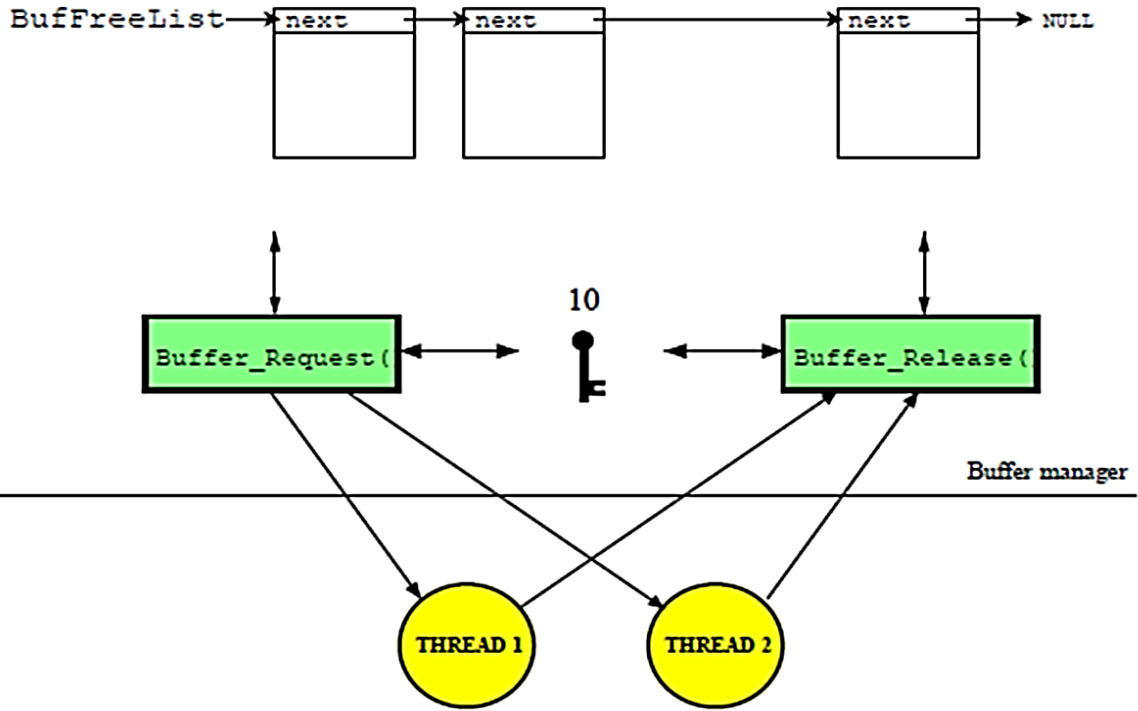
- 1. Each Question will carry 5 Marks**
- 2. Instruction: Complete the statement / Select the correct answer(s)**

S. No.	Question	CO
Q 1	For a particular scheduling algorithm, the RTOS scheduling algorithm need to run at single core processors with precedence constraint and need to optimize the finish time of all processor. How It will be represented in Grahams notation $(\alpha \beta \gamma)$	CO1
Q2	Software Unit testing consists of which of the following approach: a). Data-intensive testing: applying a large range of data variation for function parameter values, or b). Boundary value testing: Checking the system performance at the boundary values c). Scenario-based testing: exercising different method invocation sequences to perform all possible use cases as found in the requirements. d). Integration testing: Checking the integration of different units and their integration Pick the correct option i) a only ii) b and d both iii) a, b, c and d iv) a and c only v) b and c only	CO5
Q3	In a simple priority-driven preemptive scheduler, 3 periodic tasks T1, T2 and T3 . The periodic task T1 has the highest priority and executes once every 20 milliseconds and requires 5 milliseconds of execution time each time. T2 requires 10 milliseconds of processing every 50 milliseconds. T3 requires 10 milliseconds and reoccurs every 50 milliseconds. Assuming that all the tasks start at time 0, then total CPU utilization factor	CO4
Q4	The analog to digital conversion requires 3 steps sampling, quantization and encoding. Pick the wrongly mapped. a). Sampler: It is simple semiconductor switch, followed by a hold circuit which is a capacitor with a very low leakage path. b). Quantizer: It converts constant voltage maintained by the hold circuit, to a binary number.	CO1

	c). Coder: It is an optional device used for packing several samples and transmitting them in synchronous or in asynchronous mode. d). None	
Q5	Pick the wrong statement: a). SPI protocol uses master slave configuration and daisy chaining for priority assignment. b). I2C is a synchronous half-duplex protocol with multi master/ slave configuration. c). UART is used for Synchronous Parallel communication. d). All	CO3
Q6	Match the following and pick the correct option. (All option on right not necessarily match) i). 8051 ii). DSP iii). Arduino iv). Snapdragon v). Raspberry Pi a).23441 b). 21134 c). 25311 d). 12355	CO2
SECTION B		
1. Each question will carry 10 marks 2. Instruction: Write short / brief notes		
Q 7	What is interrupt. How interrupt is served with the help of interrupt service routine. Explain daisy chaining for priority interrupt.	CO3
Q 8	Discuss task states in Free RTOS along with the transition from one state to the other. What are the IPC mechanism present in FREE RTOS discuss any one in detail.	CO4
Q 9	Explain real time system and its type with example. Take any on out of the three case studies of embedded system design process A. Digital Camera B. Automatic Card Reader C. Anti-lock braking system.	CO2
Q 10	What is hardware fault model? Discuss stuck at fault and bridging fault.	CO5
Q 11	Discuss the schedulability criteria of RATE monotonic scheduling. Solve the following using and provide the finish time of each process, throughput and CPU utilization. Consider the following set of three periodic real-time tasks: T1=(10,20), T2=(15,60), T3=(20,120) to be run on a uniprocessor.	CO4
Section C		
1. Each Question carries 20 Marks. 2. Instruction: Write long answer.		

Q12

Discuss the need and Role of synchronization in real time operating system. How synchronization can be achieved with the help of semaphores. Take the above scenario and explain with the help of suitable code (C or pseudo code to provide the solution to the synchronization problem) by using the block provided. A counting semaphore is used when many copies of a resource are present. Assume that the buffer pool initially contains 10 buffers.



```
BUF* Buffer_Request(void)
{
.....
.....
.....
return (.....);
}
void Buffer_Release(BUF* ptr)
{
.....
.....
.....
}
```

CO4

OR

- a) Discuss Bartley algorithm and the feasible schedule in the following scenario.

	J₁	J₂	J₃	J₄	J₅
a_i	0	0	2	3	6
C_i	1	2	2	2	2
d_i	2	5	4	10	9

- b) Solve the following using and provide the finish time of each process, throughput and CPU utilization. Consider the following set of three periodic real-time tasks:
T1 = (10,20), T2 = (15,60), T3 = (20,120) to be run on a uniprocessor.