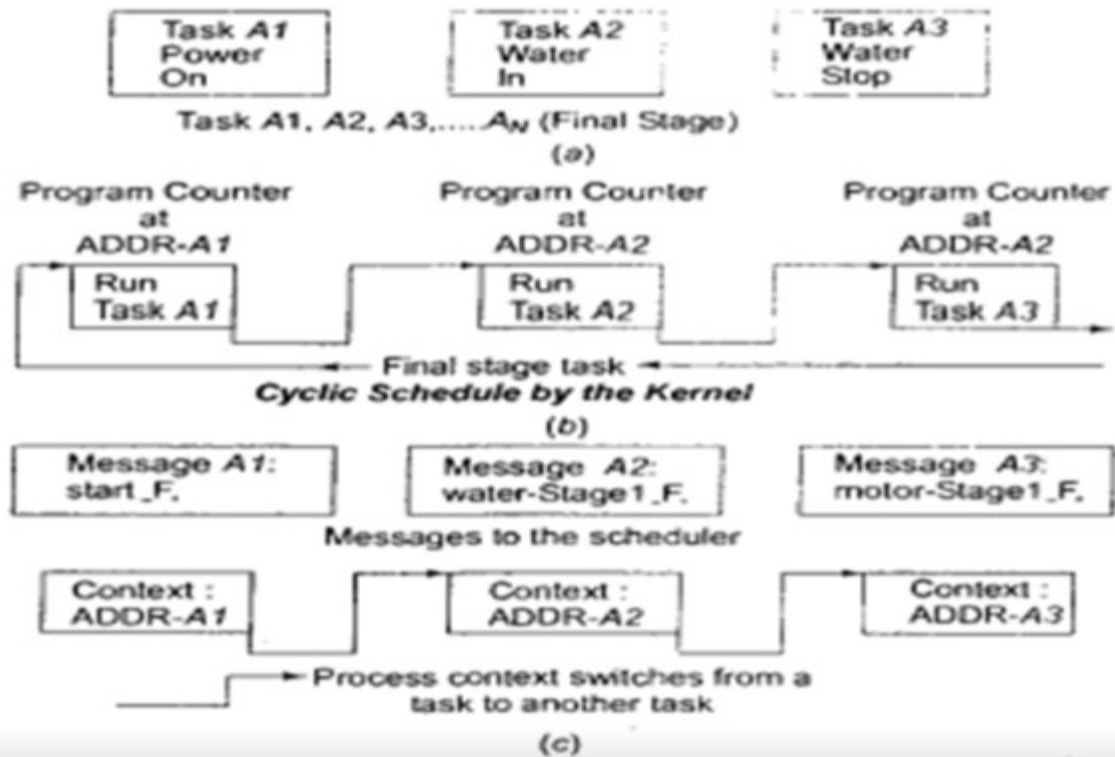


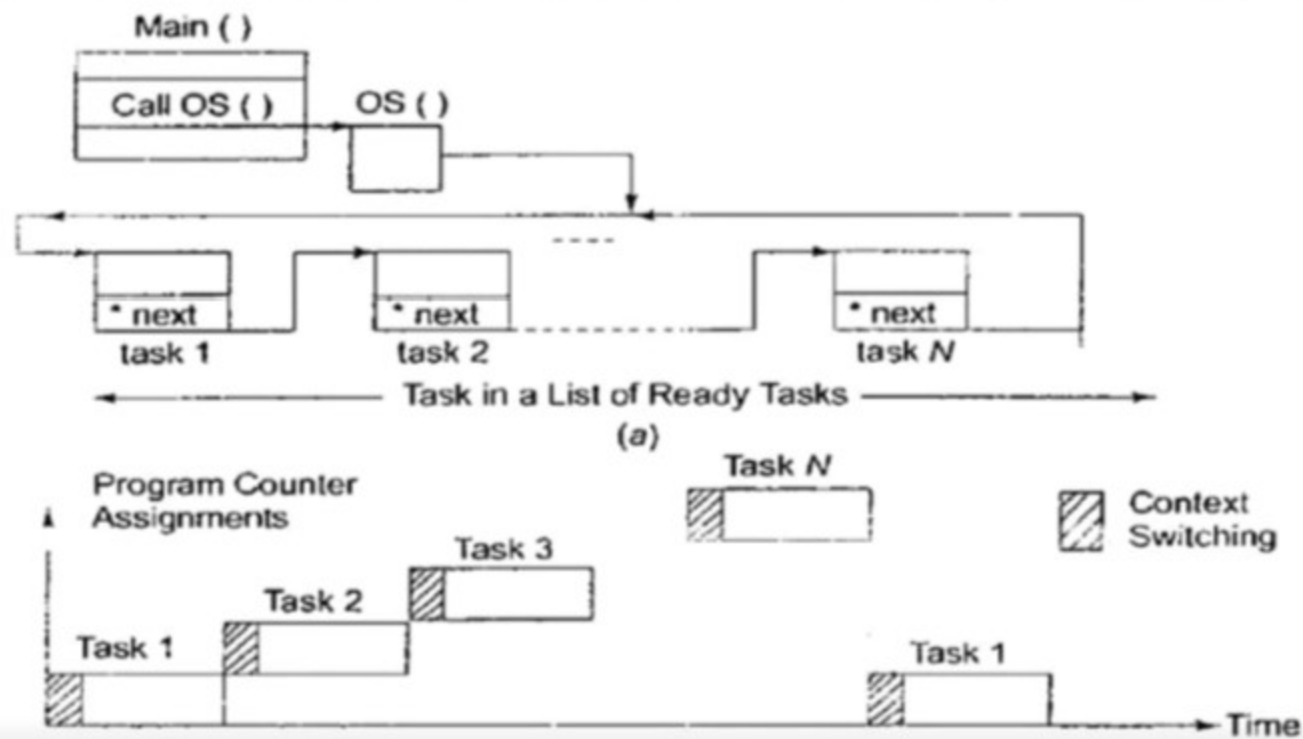
## RTOS task scheduling models

1. Cooperative Scheduling of ready tasks in a queue.
2. Cyclic and round robin (time slicing) Scheduling.
3. Preemptive Scheduling.
4. Rate-Monotonic Scheduling (RMS).
5. Scheduling using "Earliest deadline first" (EDF).

# COOPERATIVE SCHEDULING MODEL



## COOPERATIVE SCHEDULING OF READY TASK IN QUEUE:-



## 2. Cyclic and round robin (time slicing) Scheduling.

### Cyclic Scheduling

Process	Period	Comp. Time
A	25	10
B	25	8
C	50	5
D	50	4
E	100	2

```

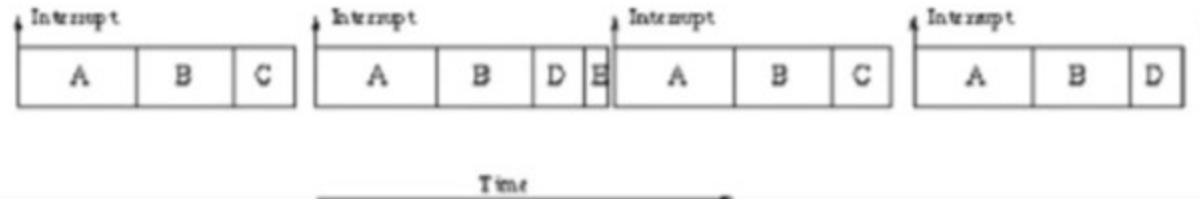
loop
  Wait_For_Interrupt;
  Procedure_For_A;
  Procedure_For_B;
  Procedure_For_C;

  Wait_For_Interrupt;
  Procedure_For_A;
  Procedure_For_B;
  Procedure_For_D;
  Procedure_For_E;

  Wait_For_Interrupt;
  Procedure_For_A;
  Procedure_For_B;
  Procedure_For_C;

  Wait_For_Interrupt;
  Procedure_For_A;
  Procedure_For_B;
  Procedure_For_D;
end loop;

```



## Round Robin (time slicing) Scheduling



- Round robin means that **each ready task runs turn by turn only in a cyclic queue for a limited time slice**

$$T_{slice} = \frac{T_{cycle}}{N}$$

Where

*T<sub>slice</sub> = Limited time slice*

*T<sub>cycle</sub> = Time cycle*

*N = Number of tasks*

- Round robin is a **hybrid model of clock-driven model** (for example cyclic model) **as well as event driven** (for example, pre-emptive)
- A real time system responds to the event within a bound time limit and within an explicit time

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- So we have five tasks , C1 to C5 that are to be scheduled. Now Five time schedules between 0 and 4 ms, 4 ms and 8 ms , 8 and 12 ms, 12 and 16ms & 16 and 20ms respectively. ( $T_{\text{slice}} = 4\text{ms}$ )

Time	Process Context	Saved Context	Task C1	Task C2	Task C3	Task C4	Task C5
0-4 ms	Task C1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4-8 ms	Task C2		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8-12 ms	Task C3	C2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12-16 ms	Task C4	C2,C3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16-20 ms	Task C5	C2,C3,C4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Started/Initiated ☐

Blocked after Saving Context ☐

Running ☐

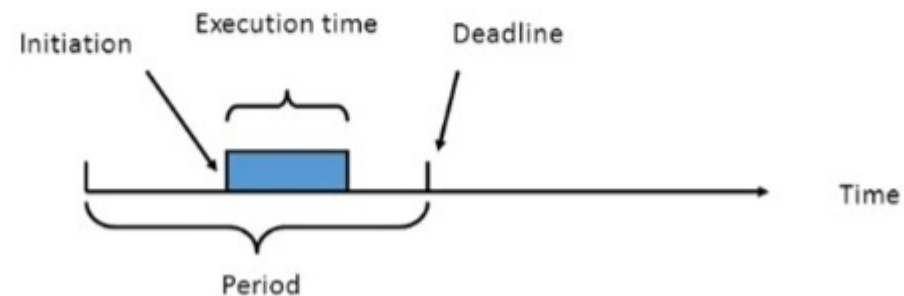
Finished ☒

Time Slicing Scheduling by the RTOS Kernel

Tasks programs contexts at the five instances in the Time Scheduling Scheduler for C1 to C5

## Typical RTOS Task Model

- Each task a triplet: (execution time, period, deadline)
- Usually, deadline = period
- Can be initiated any time during the period





## Priority-based Preemptive Scheduling

- Always run the highest-priority runnable process

