

# Unit 8 - Week 6

## Course outline

### How to access the portal

### Pre-Requisite Assignment

#### Week 1

#### Week 2

#### Week 3

#### Week 4

#### Week 5

#### Week 6

- Scheduling: problem formulation
- Example: differential equation solver
- Heuristic approaches to scheduling
- Mathematical formulation
- ILP formulation
- List scheduling
- Hardware model
- Force Directed Scheduling
- DEMO: HLS on FFT
- DEMO: FFT Simulation and Optimization
- DEMO: CPU interfacing
- Quiz : Assignment 6

Week 6 Feedback : Mapping Signal Processing Algorithms to Architectures

#### Week 7

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## Assignment 6

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2019-09-18, 23:59 IST.**

1) In general, the scheduling problem is computationally intractable

1 point

- True  
 False

No, the answer is incorrect.  
Score: 0

Feedback:

**Solution :** Worst case time for finding an optimum schedule is exponential, and in terms of complexity theory, it can be shown to be NP-hard as an optimization problem

Accepted Answers:

True

2) The integer linear programming formulation can be used to obtain a true optimum solution for scheduling

1 point

- True  
 False

No, the answer is incorrect.  
Score: 0

Feedback:

**Solution:** Yes, ILP formulation can be used to pose the problem in such a way that a truly optimum schedule is found. However, solving this may take exponential time

Accepted Answers:

True

3) List scheduling can always be used to obtain a true optimum solution for scheduling

1 point

- True  
 False

No, the answer is incorrect.  
Score: 0

Feedback:

**Solution:** List scheduling is a heuristic approach - in general it cannot guarantee optimal answers. There may be specific special cases where it will give optimal answers, but not in general

Accepted Answers:

False

4) For which of the following conditions will ASAP always give the optimum solution:

1 point

- Resource Unconstrained Latency Unconstrained  
 Resource Unconstrained Latency Constrained  
 Resource Constrained Latency Unconstrained  
 Resource Constrained Latency Constrained

No, the answer is incorrect.  
Score: 0

Feedback:

**Solution:** ASAP will find the minimum latency always, so it can find a solution with the smallest possible latency constraint. However, it cannot take into account resource limitations

Accepted Answers:

Resource Unconstrained Latency Constrained

The figure shows a task graph corresponding to the differential equation solver problem.  $M$  denotes a multiplication operation, and  $A$  denotes an addition/subtraction type operation. If you assume that each  $M$  operation takes 2 clock cycles and each  $A$  operation takes 1 cycle, answer the following Note that the multiplier is not pipelined, so the next multiplication can start only after the present one has completed.

5) What is the length of the critical path of the circuit (in cycles): \_\_\_\_\_

No, the answer is incorrect.  
Score: 0

Accepted Answers:

(Type: Numeric) 6

1 point

If we want to schedule the entire graph for a maximum allowed time of 8 cycles, then (assuming that the cycles are numbered starting from 1 and going up to 8):

6) For an ASAP schedule, when will operation 4 be scheduled (cycle number): \_\_\_\_\_

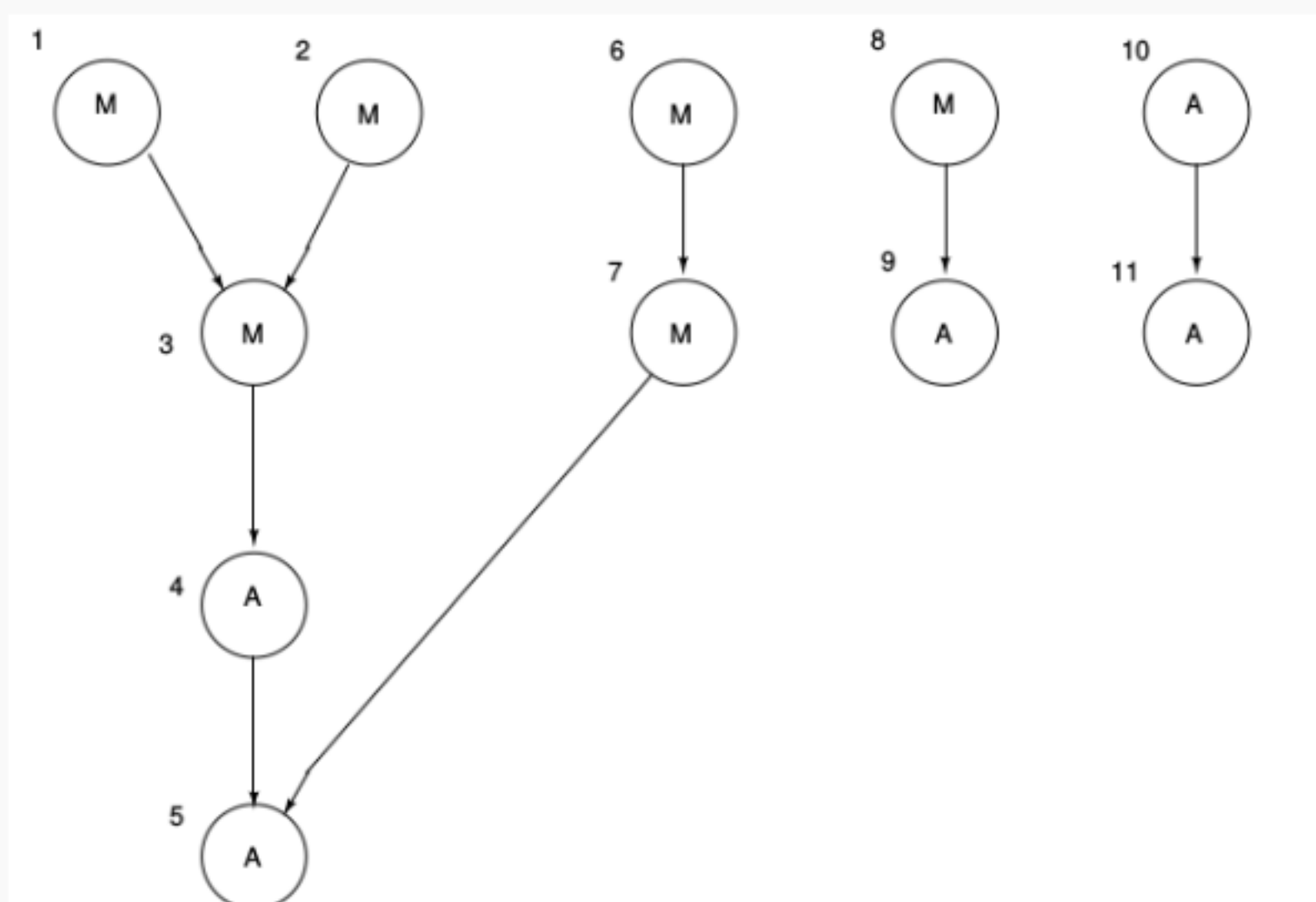
No, the answer is incorrect.  
Score: 0

Accepted Answers:

(Type: Numeric) 5

1 point

7) For an ALAP schedule, when will operation 4 be scheduled \_\_\_\_\_




No, the answer is incorrect.  
Score: 0

Accepted Answers:

(Type: Numeric) 7

1 point

8) What is the slack of operation 4 (in cycles)? \_\_\_\_\_

No, the answer is incorrect.  
Score: 0

Accepted Answers:

(Type: Numeric) 2

1 point

9) What is the minimum schedule length (in cycles) that can be achieved if you are allowed to use only  $2M$  type hardware units (no limit in  $A$  units)? \_\_\_\_\_

No, the answer is incorrect.  
Score: 0

Accepted Answers:

(Type: Numeric) 7

2 points