Feedback — Quiz Week 4

Help Center

Thank you. Your submission for this quiz was received.

You submitted this quiz on **Mon 9 Nov 2015 11:02 PM CET**. You got a score of **2.00** out of **5.00**. You can attempt again, if you'd like.

Question 1

Select the three ways to remove behavior, i.e. allowed traces, from a Petri net.

Your Answer		Score	Explanation
☐ Add transitions to the Petri net.	✔	0.08	
☑ Remove transitions from the Petri net.	✔	0.08	
☑ Add an input place to a transition in the Petri net.	✔	0.08	
☐ Remove a place, that is an input place to a transition, from the Petri net.	✔	0.08	
☑ Add an arc from a place to a transition.	✔	0.08	
☐ Remove an arc from a place to a transition.	✔	0.08	
Total		0.50 / 0.50	

Question Explanation

Ways to add or remove behaviour from a Petri net are discussed in more detail in lecture 4.2: 'Alternative Process Discovery Techniques'.

Question 2

Which of the following brief algorithm descriptions describes how a language based region approach works?

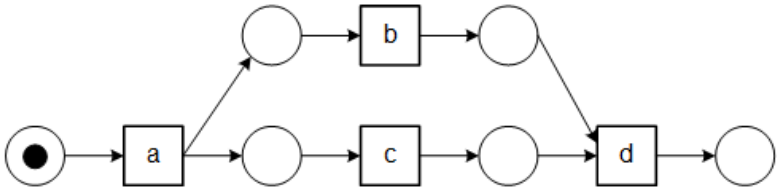
Your Answer		Score	Explanation
○ The algorithm tries to find splits of the event log that can be described by a control flow relation, and then repeats this approach on each of the split event logs.			
○ The algorithm tries to find feasible places between transitions by solving an optimization problem.			
◉ The algorithm creates a collection of process models and evaluates them on one or more quality aspects, after which some models are changed and re-evaluated until one process model is returned as the end result.	✖	0.00	
Total		0.00 / 0.50	

Question Explanation

This algorithm, amongst others, is explained in more detail in lecture 4.2: 'Alternative process discovery techniques'.

Question 3

Given the process model below and the following event log: [< a,b,c,d>^{10}]



What is the correct footprint-based conformance?

Your Answer	Score	Explanation

Footprint of the process model:

	a	b	c	d
a	#	→	→	#
b	←	#	||	→
c	←	||	#	→
d	#	←	←	#

Footprint of the event log:

	a	b	c	d
a	#	→	#	#
b	←	#	→	#
c	#	←	#	→
d	#	#	←	#

Of the 10 cells that have values, 6 are different between the two tables, hence the footprint-based conformance is $1 - \frac{6}{10} = 1 - 0.6 = 0.4$

Footprint of the process model:

	a	b	c	d
a	#	→	→	#
b	←	#	→	→
c	←	→	#	→
d	#	←	←	#

Footprint of the event log:

	a	b	c	d

a	#	→	#	#
b	←	#	→	#
c	#	←	#	→
d	#	#	←	#

Of the 10 cells that have values, 4 are different between the two tables, hence the footprint-based conformance is $1 - \frac{4}{10} = 1 - 0.4 = 0.6$

Footprint of the process model:

	a	**b**	**c**	**d**
a	#	→	→	#
b	←	#	→	→
c	←	←	#	→
d	#	←	←	#

Footprint of the event log:

	a	**b**	**c**	**d**
a	#	→	#	#
b	←	#	→	#
c	#	←	#	→
d	#	#	←	#

Of the 16 cells, 4 are different between the two tables, hence the footprint-based conformance is $1 - \frac{4}{16} = 1 - 0.25 = 0.75$

Footprint of the process model:

	a	**b**	**c**	**d**
a	#	→	→	#
b	←	#	||	→
c	←	||	#	→
d	#	←	←	#

✔ 0.50 These are indeed the correct footprints and application of the conformance formula.

Footprint of the event log:

	a	**b**	**c**	**d**
a	#	→	#	#
b	←	#	→	#
c	#	←	#	→

d	#	#	←	#

Of the 16 cells, 6 are different between the two tables, hence the footprint-based conformance is $1 - \frac{6}{16} = 1 - 0.375 = 0.625$

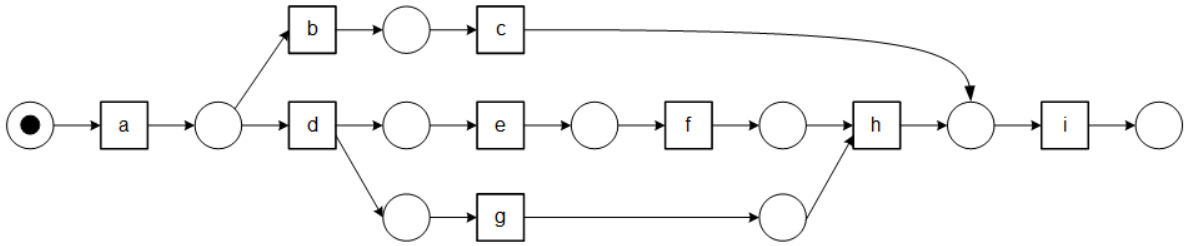
Total	0.50 / 0.50

Question Explanation

Footprint-based conformance is explained in detail in lecture 4.4: 'Conformance checking using causal footprints'.

Question 4

Given the process model below and the following event log: [< a,b,c,h,i>^{5}, < a,b,e,f,g,h,i>^{4}, < a,d,e,g,f,h,i >]



What is the correct footprint-based conformance?

Your Answer	Score	Explanation
✖ $1 - \frac{20}{81} = 0.7531.$	0.00	This is not the correct answer, see the question level explanation for more details.
$1 - \frac{10}{81} = 0.8765$		
$1 - \frac{27}{81} = 0.6667.$		
$1 - \frac{17}{81} = 0.7901.$		
Total	0.00 / 0.50	

Question Explanation

The footprint of the process model is:

	a	b	c	d	e	f	g	h	i
a	#	→	#	→	#	#	#	#	#
b	←	#	→	#	#	#	#	#	#
c	#	←	#	#	#	#	#	#	→
d	←	#	#	#	→	#	→	#	#
e	#	#	#	←	#	→	||	#	#
f	#	#	#	#	←	#	||	→	#
g	#	#	#	←	||	||	#	→	#
h	#	#	#	#	#	←	←	#	→
i	#	#	←	#	#	#	#	←	#

The footprint of the event log is:

	a	b	c	d	e	f	g	h	i
a	#	→	#	→	#	#	#	#	#
b	←	#	→	#	→	#	#	#	#
c	#	←	#	#	#	#	#	→	#
d	←	#	#	#	→	#	#	#	#
e	#	←	#	←	#	→	→	#	#
f	#	#	#	#	←	#	||	→	#
g	#	#	#	#	←	||	#	→	#
h	#	#	←	#	#	←	←	#	→
i	#	#	#	#	#	#	#	←	#

The following table indicates which cells have different values between the two footprints:

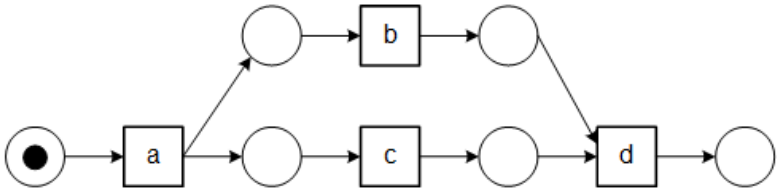
	a	b	c	d	e	f	g	h	i
a									
b					x				
c								x	x
d							x		
e		x					x		
f									
g				x	x				
h			x						
i			x						

Of the 81 cells there are 10 mismatches between the two footprints. The footprint-based conformance therefore is $1 - \frac{10}{81} = 0.8765$.

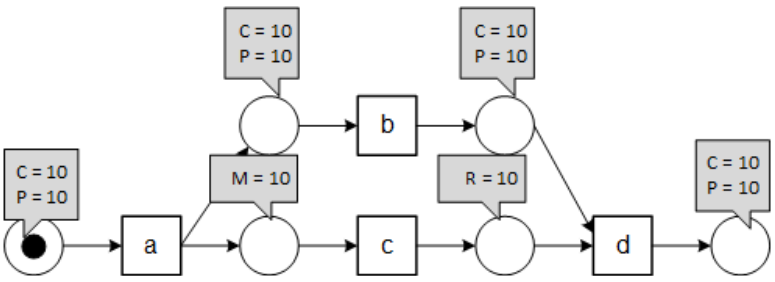
Footprint-based conformance is explained in detail in lecture 4.4: 'Conformance checking using causal footprints'.

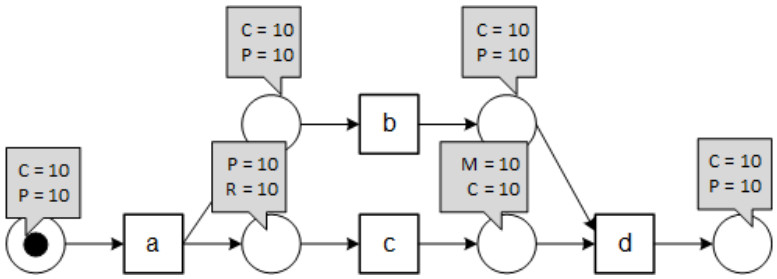
Question 5

Given the process model below and the following event log: [< a,b,d>^{10}]



What is the correct token-based conformance?

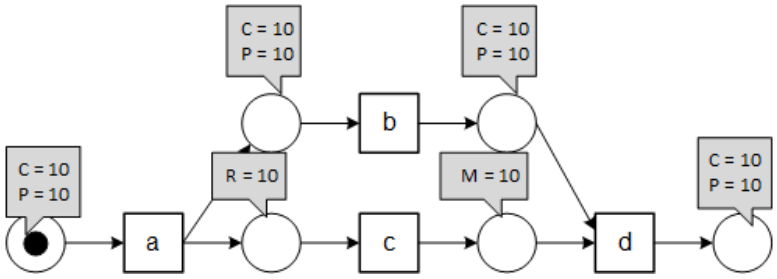
Your Answer	Score	Explanation
 Hence the token-based conformance is $1 - \frac{10+10}{40+40+10+10}) = 1 - \frac{20}{100} = 0.80$		
	✔ 0.50	This is indeed the correct answer. First of all the Petri net correctly records the



Hence the token-based conformance is

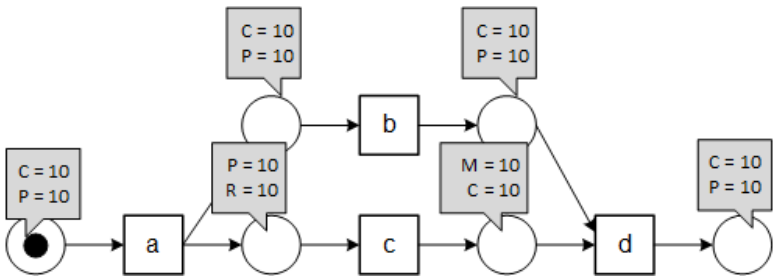
$\frac{1}{2}(1-\frac{10}{50})+\frac{1}{2}(1-\frac{10}{50})=\frac{1}{2}\times 0.80+\frac{1}{2}\times 0.80=0.80$

remaining and missing tokens after replay, including the 10 tokens produced in the initial place and consumed from the final place. Furthermore, the correct formula is used (the full formula is shown in the explanation of the next question).



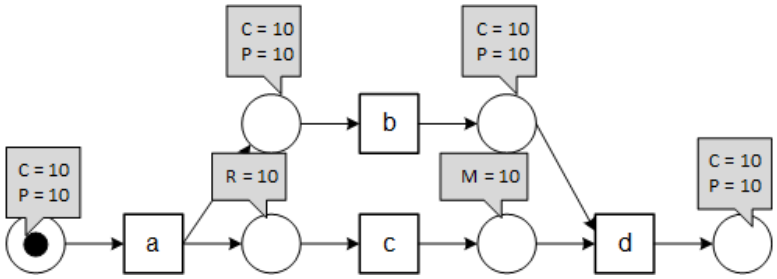
Hence the token-based conformance is

$\frac{1}{2}(1-\frac{10}{40})+\frac{1}{2}(1-\frac{10}{40})=\frac{1}{2}\times 0.75+\frac{1}{2}\times 0.75=0.75$



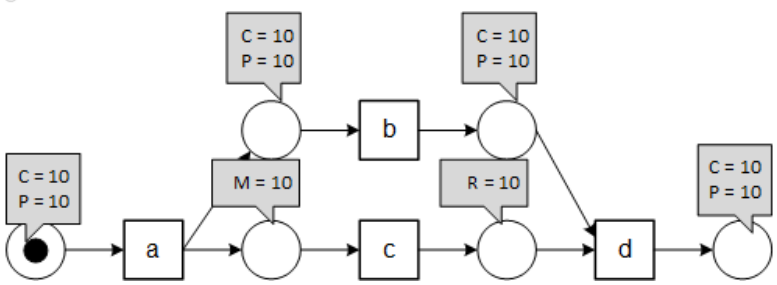
Hence the token-based conformance is

$1-\frac{10+10}{50+50+10+10})=1-\frac{20}{120}=0.8333$



Hence the token-based conformance is

$1-\frac{10+10}{40+40+10+10})=1-\frac{20}{100}=0.80$



Hence the token-based conformance is

$\frac{1}{2}(1-\frac{10}{40})+\frac{1}{2}(1-\frac{10}{40})=\frac{1}{2}\times 0.75+\frac{1}{2}\times 0.75=0.75$

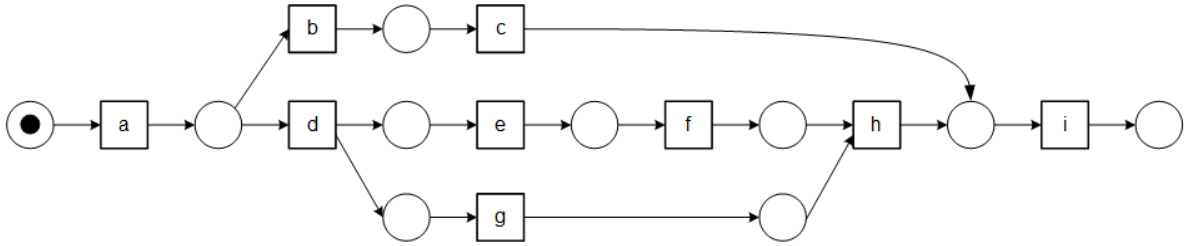
Total	0.50 / 0.50

Question Explanation

Conformance checking using token-based replay is explained in more detail in lecture 4.5: 'Conformance checking using token-based replay'.

Question 6

Given the process model below and the following event log: [< a,b,c,h,i >^{5}, < a,b,e,f,g,h,i >^{4}, < a,d,e,g,f,h,i >]

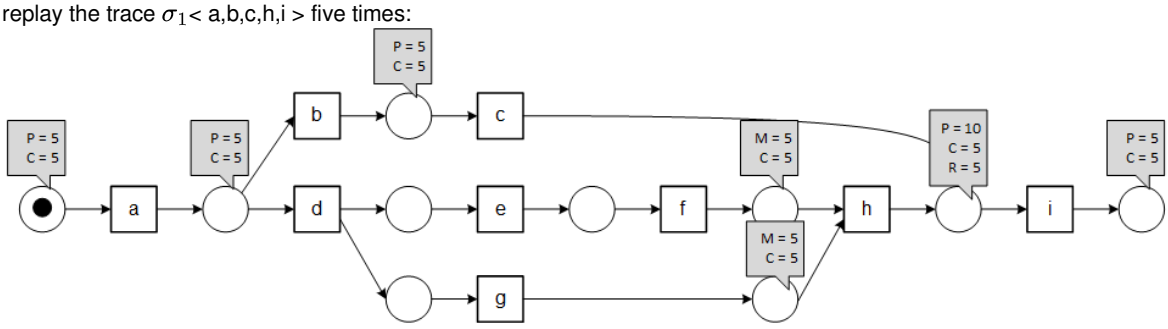


What is the correct token-based conformance?

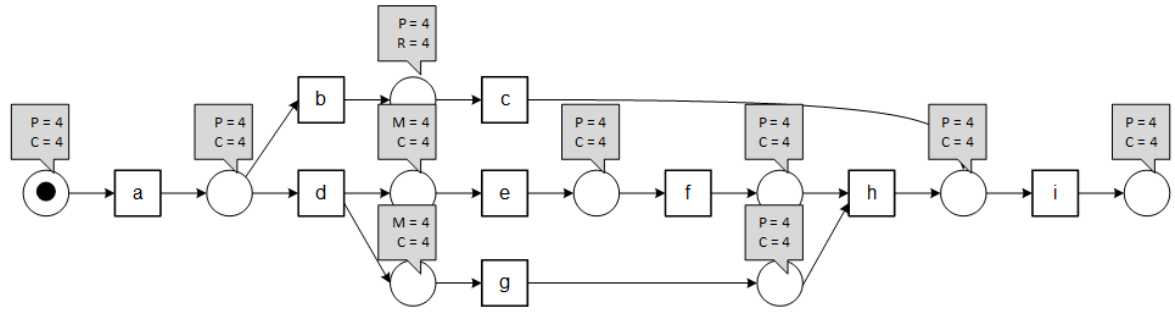
Your Answer	Score	Explanation
$\frac{1}{2}(1-\frac{18}{80})+\frac{1}{2}(1-\frac{9}{71})=0.8241$		
$\frac{1}{2}(1-\frac{4}{25})+\frac{1}{2}(1-\frac{2}{23})=0.8765$		
$\frac{1}{2}(1-\frac{18}{70})+\frac{1}{2}(1-\frac{9}{61})=0.7977$ ✖	0.00	This is the answer you have probably obtained by not including the tokens produced (p) in the initial place and consumed (c) from the final place.
$\frac{1}{2}(\frac{66}{70})+\frac{1}{2}(\frac{59}{61})=0.9550$		
Total	0.00 / 0.50	

Question Explanation

The token-based replay results in the following number of consumed, produced, remaining and missing tokens to replay the trace σ_1< a,b,c,h,i > five times:

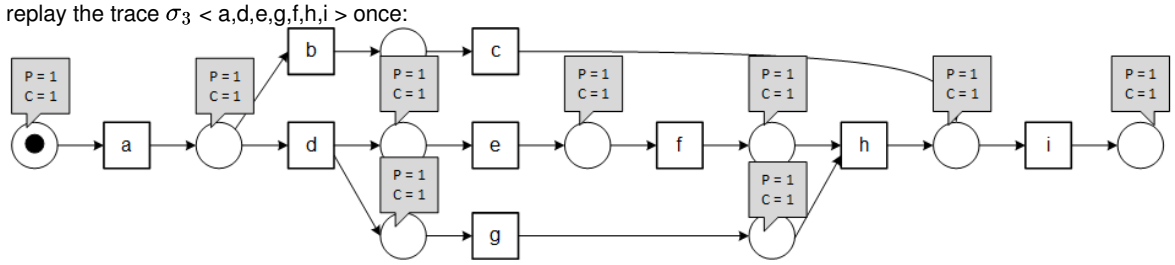


Which results in c=35, p=30, m=10 and r=5 for σ_1
The token-based replay results in the following number of consumed, produced, remaining and missing tokens to replay the trace σ_2 < a,b,e,f,g,h,i > four times:



Which results in c=36, p=32, m=8 and r=4 for σ_2

The token-based replay results in the following number of consumed, produced, remaining and missing tokens to replay the trace σ_3 < a,d,e,g,f,h,i > once:



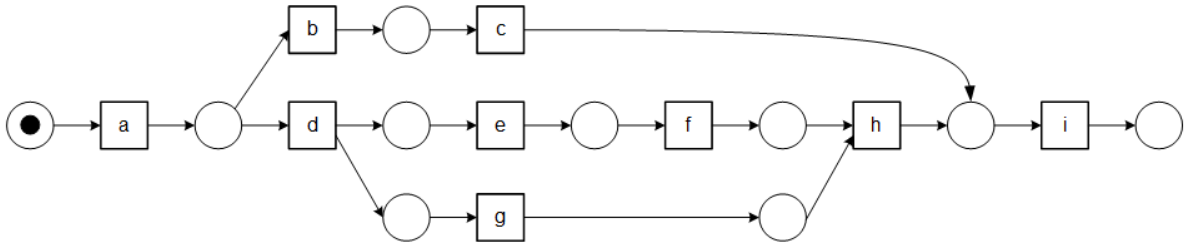
Which results in c=9, p=9, m=0 and r=0 for σ_3

The token-based conformance is calculated by filling in the following formula:

$$\text{fitness}(L,N) = \frac{1}{2}\left(1 - \frac{\sigma_{\sigma \in L} L(\sigma) \times m_{N,\sigma}}{\sigma_{\sigma \in L} L(\sigma) \times c_{N,\sigma}}\right) + \frac{1}{2}\left(1 - \frac{\sigma_{\sigma \in L} L(\sigma) \times r_{N,\sigma}}{\sigma_{\sigma \in L} L(\sigma) \times p_{N,\sigma}}\right) = \frac{1}{2}\left(1 - \frac{10+8+0}{35+36+9}\right) + \frac{1}{2}\left(1 - \frac{5+4+0}{30+32+9}\right) =$$
$$\frac{1}{2}\left(1 - \frac{18}{80}\right) + \frac{1}{2}\left(1 - \frac{9}{71}\right) = \frac{1}{2}\left(1 - 0.225\right) + \frac{1}{2}\left(1 - 0.1268\right) = \frac{1}{2}\left(0.775\right) + \frac{1}{2}\left(0.8732\right) = 0.3875 + 0.4366 = 0.8241$$

Question 7

Given the process model below and the following trace: < a,b,e,f,g,h,i >



Which of the following is the optimal alignment, assuming all costs for move on model and move on log, for all activities, are 1.

Your Answer	Score	Explanation
trace: a b >> e f g h i model: a >> d e f g h i		
trace: a b >> e f g h i model: a b c >> >> >> >> i	✖ 0.00	This is a correct alignment, but with a cost of 5 it is not optimal. Note that the token-based replay proposes this model execution for this trace.
trace: a b >> >> >> e f g h i model: a >> c i d e f g h i		

trace:	a	b	>>	>>	e	f	g	h	i
model:	a	>>	c	d	e	f	g	h	i

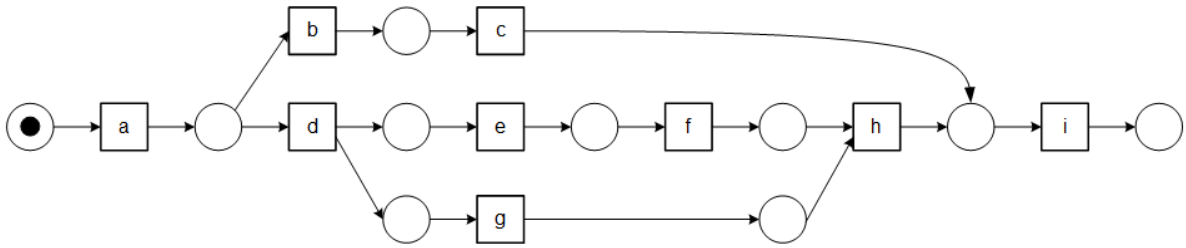
Total 0.00 / 0.50

Question Explanation

Alignments based conformance is explained in more detail in lecture 4.7: 'Aligning observed and modeled behavior'.

Question 8

Given the process model below and the following event log: [< a,b,c,h,i >^{5}, < a,b,e,f,g,h,i >^{4}, < a,d,e,g,f,h,i >]



What is the correct alignment-based conformance for this event log, assuming all costs for move on model and move on log, for all activities, are 1?

Hint: first calculate the fitness per trace, as is explained in the lecture. Then calculate the weighted average (or weighted arithmetic mean) using the trace frequency as weight.

Your Answer	Score	Explanation
$(\frac{1}{9}+\frac{2}{11}+0)/3=0.2929/3=0.10$		
$(\frac{8}{9}+\frac{9}{11}+1)/3=2.4432/3=0.81$		
$(\frac{8}{10}\times 5+\frac{9}{10}\times 4+1\times 1)/(5+4+1)=(\frac{40}{10}+\frac{36}{10}+1)/10=8.6/10$		
$(\frac{2}{10}\times 5+\frac{1}{10}\times 4+0\times 1)/(5+4+1)=(\frac{10}{10}+\frac{4}{10}+0)/10=1.4/10$	✖ 0.00	This is incorrect, as is shown in the question level explanation, since the length of the alignment is not 10 for all alignments. Additionally, the replay fitness per trace is incorrectly calculated.
$(\frac{8}{9}\times 5+\frac{9}{11}\times 4+1\times 1)/(5+4+1)=(\frac{40}{9}+\frac{36}{11}+1)/10=8.7171/$		
$(\frac{1}{9}\times 5+\frac{2}{11}\times 4+0\times 1)/(5+4+1)=(\frac{5}{9}+\frac{8}{11}+0)/10=1.2828/1$		
Total	0.00 / 0.50	

Question Explanation

For all traces we can use the trace length plus the shortest path through the model (< a,b,c,i >) to normalize the deviation cost.
The trace < a,b,c,h,i > can be aligned with a cost of 1 (a 'move on log' for event 'h'). Hence, $f_1 = 1 - \frac{1}{5+4} = \frac{8}{9}$
The trace < a,b,e,f,g,h,i > can be aligned with a cost of 2 (a 'move on log' for event b and a 'move on model' for activity d). Hence $f_2 = 1 - \frac{2}{7+4} = \frac{9}{11}$
The trace < a,d,e,g,f,h,i > can be aligned without cost. Hence $f_3 = 1 - \frac{0}{7+4} = 1$
The overall fitness of the event log on the given model therefore is
$(\frac{8}{9} \times 5 + \frac{9}{11} \times 4 + 1 \times 1)/(5+4+1) = (\frac{40}{9} + \frac{36}{11} + 1)/10 = 8.7171/10 = 0.87$

Alignments based conformance is explained in more detail in lecture 4.7: 'Aligning observed and modeled behavior'.

Question 9

Which of the following conformance checking techniques suffers from the problem that the frequency of occurrence of the traces is not considered?

Your Answer		Score	Explanation
Conformance checking using alignments.	✖	0.00	Currently conformance checking with alignments is the most robust conformance technique, mainly because it finds an optimal explanation of observed deviations. It also considers the frequency of the traces. This technique is discussed in more detail in lecture 4.7: 'Aligning observed and modelled behavior'.
Conformance checking using causal footprints.			
Conformance checking using token-based replay.			
Total		0.00 / 0.50	

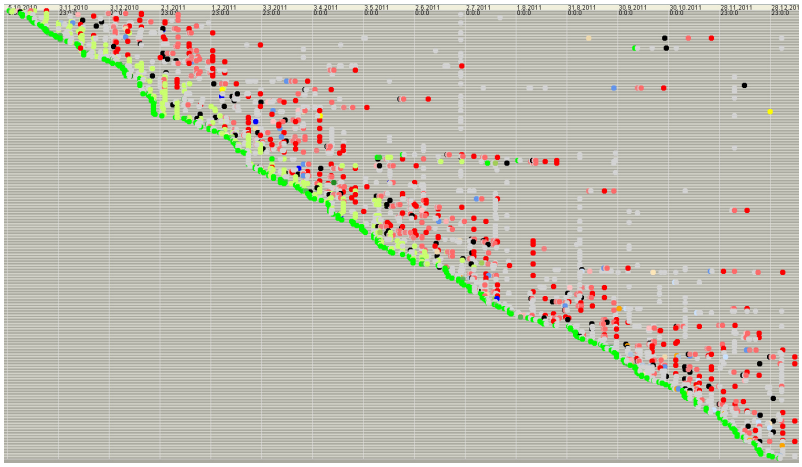
Question Explanation

Footprint-based conformance is explained in detail in lecture 4.4: 'Conformance checking using causal footprints'.
Conformance checking using token-based replay is explained in more detail in lecture 4.5: 'Conformance checking using token-based replay'.
Alignments based conformance is explained in more detail in lecture 4.7: 'Aligning observed and modeled behavior'.
At the end of each lecture the advantages and disadvantages of each approach are discussed.

Question 10

Consider the Dotted Chart shown below (click to enlarge). The default settings are used: each row is a case, time goes from left to right, each dot is an event and the color of the dot indicates the activity performed.

Which of the following observations can be made based on this chart?



Your Answer		Score	Explanation
☐ Each resource performs one type of activity.	✔	0.12	This observation cannot be made since resources are not included in this setting of the Dotted Chart.
☑ The arrival rate of cases is steady in general.	✔	0.12	We can draw a straight line alongside the green dots, indicating a relatively steady arrival of cases (with a small peak around end of 2010). See also the 'Arrival Rate Line' in the annotated Dotted Chart above.
☑ For some cases events are recorded a long time after their arrival, while for the majority of cases most activities are observed in the first couple of months after arrival.	✔	0.12	This is best visible in the top right corner: activities are recorded for some of the cases that arrived roughly a year ago. For most of the other cases no further activities are recorded since the area in the top right is not as densely populated with dots as the area closely after arrival of the case. See also the 'Late Activity' box in the annotated Dotted Chart above.
☑ Certain activities are executed in batches (e.g. for multiple cases on the same time).	✔	0.12	This is indeed the case. The grey activities form vertical lines, an indication of batch execution of this activity. See also the 'Batching' box in the annotated Dotted Chart above.
Total		0.50 / 0.50	

Question Explanation

Annotated Dotted Chart (referred to from the option level explanations):