

Faculty of Engineering Technology

Written Exam	Rail Transport
Teacher	Van Zuilekom, Van Es
Course code	201100013
Date and time	16-04-2014, 13:45-17:15 hour
Location	HT 700A
Remarks	Closed book, calculator allowed Formulas and tables are, when necessary, are part of the question. Answering in Dutch is allowed

Calculation of the marks:

The maximum number of points, P_{max} , is 100

Calculation of the marks for the written exam, C :

$$C = 1 + 9 \cdot \frac{P}{P_{max}}$$

Where P is the sum of points.

Available time is 210 minutes.

The points per question roughly reflect the time needed for answering the question.

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Q 1: Dresden Hbf Terminus [12 points]



Dresden Hbf (Haupt Bahnhof main station) is a so called Terminus (a terminal at the beginning or end of a line).

Describe the characteristics / (dis) advantages of a Terminus from:

1A. The passenger point of view [6 points]

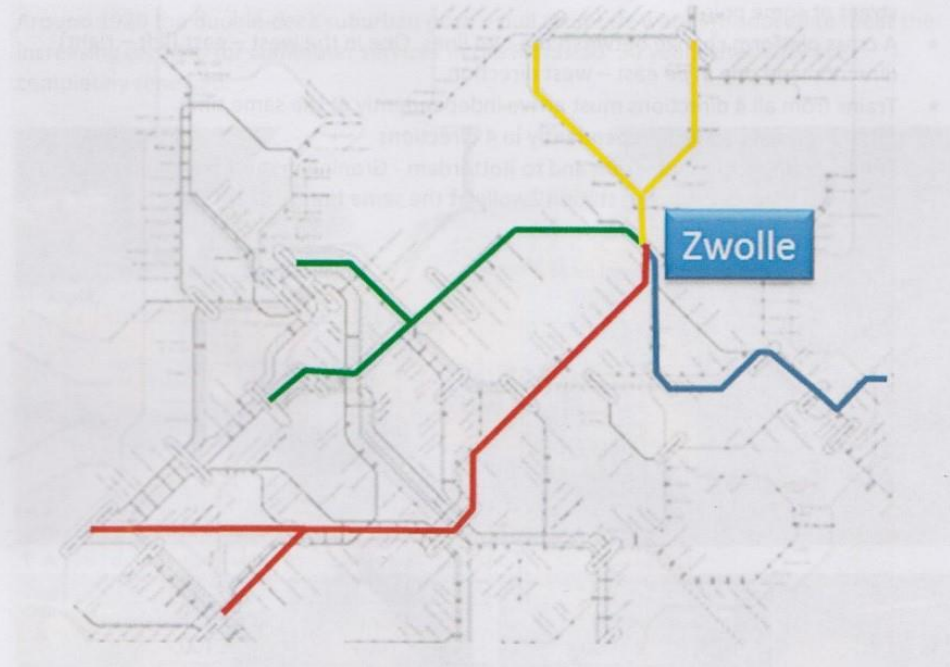
1B. The train system point of view (train types / infrastructure) [6 points]

Q 2: Freight transport differences around the world [6 points]

In the Netherlands the share of freight transport in train kilometres is 7%. The share of freight transport in the United States is more than 95%. The share of freight transport in central Europe is somewhere in between.

Give an explanation for these three situations.

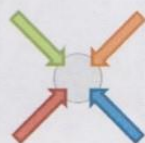
Q 3: Zwolle [20 points]



Zwolle station is a very important node in the Dutch railway network. At this station two corridors meet:

1. The **Flevo – North line** link: Amsterdam / Schiphol - Lelystad - Zwolle - Meppel - Groningen / Leeuwarden.
2. The **Veluwe – IJssel Line** link: Den Haag / Rotterdam - Utrecht - Amersfoort - Zwolle - Deventer - Hengelo - Oldenzaal / Germany.

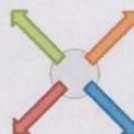
At Zwolle station a specific process takes place. Trains from 4 directions arrive at the same time (figure 1). All trains stop for several minutes to allow passengers to change trains (figure 2). After a few minutes all the trains depart at the same time (figure 3).



[1]



[2]



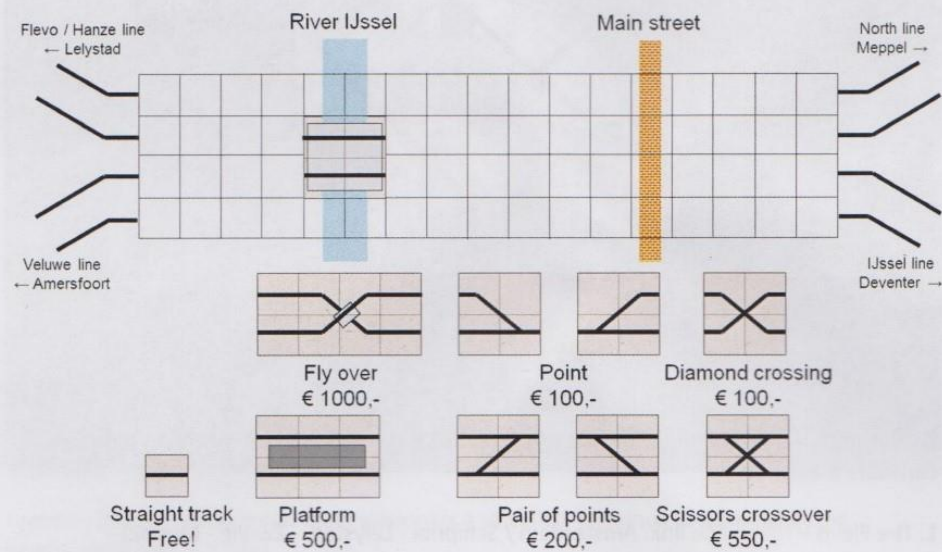
[3]

Every 15 minutes this process takes place.

In between every quarter of the hour, freight trains pass the station. The freight trains run between Rotterdam and Groningen (**Veluwe line – North Line**).

The station of Zwolle will be completely rebuild. The requirements are:

- The new station must be connected to Main street (the platform must overlap Main street at some point).
- A cross platform change between the two lines. One in the west – east (left – right) direction and one in de east – west direction.
- Trains from all 4 directions must arrive independently at the same time.
- All trains must depart independently in 4 directions.
- Freight train movements from and to Rotterdam - Groningen must have independent routes so they can pass the station Zwolle at the same time.



Restrictions:

- There is already a double track bridge across the river IJssel. It is not possible to build an extra bridge.
- Stay inside the checkerboard.
- Use only standard elements.
- Maximum costs: € 2500,-

Note: at page 11 of this exam you will find an answering form which you may use.

Q 4: Midlife update rolling stock [12 points]

Around 1980 the double-deck suburban push – pull train sets were introduced to meet the increasing demand for commuter services in the Randstad. 30 years later they are completely renewed.



↑ A 1980 double-deck suburban push – pull train set



↑ Old interior second class



↑ Old interior first class



↑ New interior second class



↑ New interior first class

4A. Explain the difference in interior and describe the old and new product – market combination. Motivate your answer. [6 points]

4B. Explain why this train set is no longer suitable for all station services in the Randstad. Motivate your answer. [6 points]

Q 5: Platforms [4 points]

The requirements for a platform are:

- a gradient of less than 1% and;
- a horizontal curve with a radius of at least 15000 meter.

Explain why.

Q 6: Rubber versus steel [5 points]



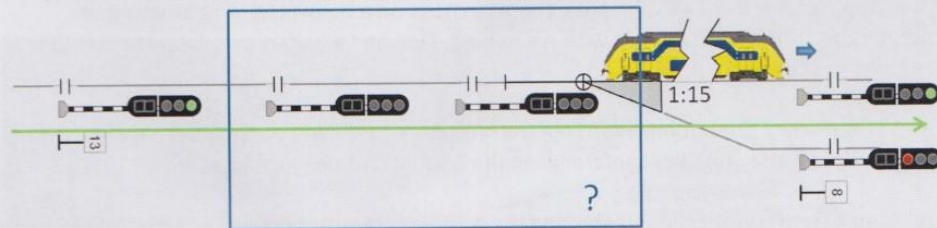
Some guided transport systems like e.g. Paris metro lines have rubber tyres instead of (full) steel wheels.

Why? Give the advantages and disadvantages.

Q 7: Signal aspects [4 points]

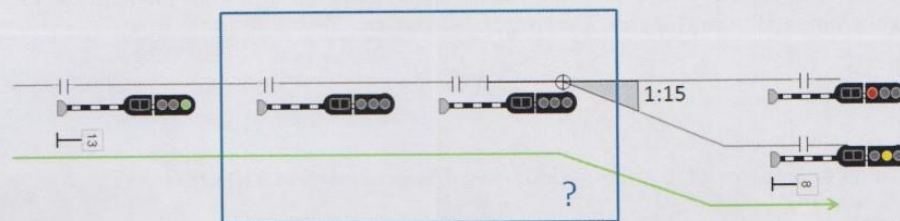
Complete the schemes with the missing signal aspects. N.B. the distance between the signal posts is sufficient for the breaking curve.

8A Situation 1. [2 points]



Use R = ● Y = ● G = ●
 And - if necessary- add a number / figure; 8, 6, 4
 or signs / signal boards.
 13 4 8
 ————— = route

8B Situation 2. [2 points]



Q 8: AeroCity [18 points]

Movares engineering consultancy (NL) presents a new mobility concept for the future. This so called AeroCity transport system is based on a wing shaped vehicle with a capacity of around 100 passengers.

At low speed the vehicle runs on wheels. When it accelerates above 200 km/h the vehicle 'floats' on air due to its aerodynamic characteristics on a dedicated infrastructure. It accelerates from 0 to 200 km/h within a minute. One and a half minute later the AeroCity reaches its top speed of 500 km/h.

Movares made a promotion video (see the stills from this video on the next page) which will be presented at a mobility conference in the Middle East (for example Dubai).

An Arabic state considers implementing the AeroCity transport system as a possible solution to its national public transport network.

You are the consultant for this Arabic state. The only available source is this video and the information above.

What would your advice be, taking in to account all the aspects of a rail (public) transport system (product – market combination, type of service, frequency, infrastructure layout, safety measures etc.) (advantages / disadvantages).

Within the outlines of this question; you are the expert! Write a small (management / governmental) essay (approx. 1 A4 page).

Video stills source: <http://www.youtube.com/watch?v=HrE1ddOQaDo>



ATTRACTIVE ALTERNATIVE

Movares



Movares



LOW ENERGY

Movares



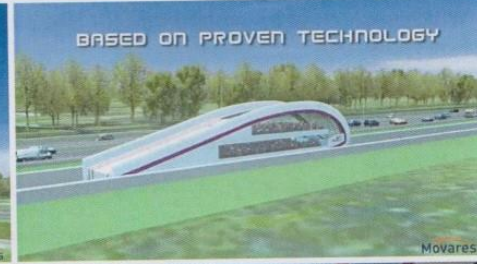
EXTREME WING-IN-GROUND EFFECT

Movares



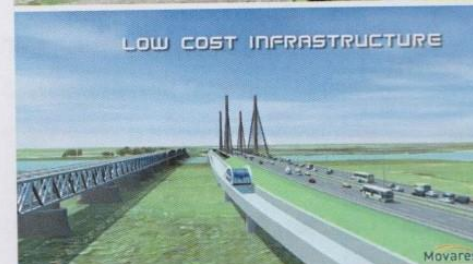
LOW EMISSION

Movares



BASED ON PROVEN TECHNOLOGY

Movares



LOW COST INFRASTRUCTURE

Movares



LUXURY TRAVEL

Movares



HIGH TECH

Movares



HIGH PERFORMANCE

Movares



LOW NOISE

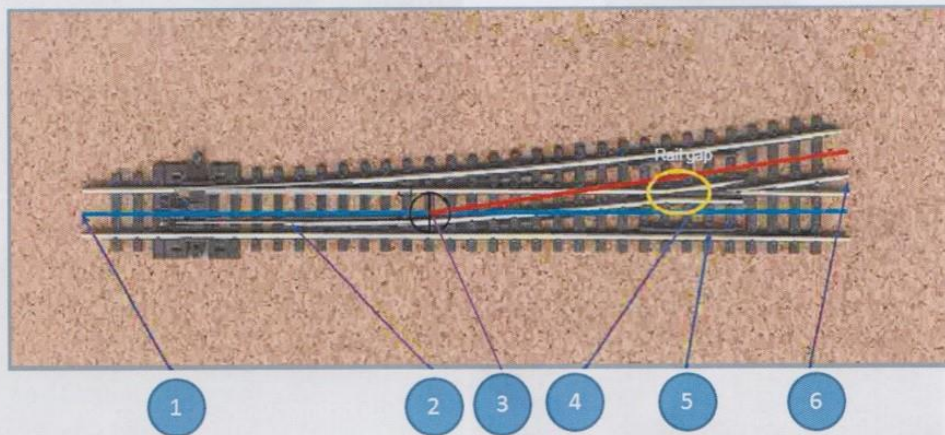
Movares



LOW MAINTENANCE COSTS

Movares

Q 9: The turnout [7 points]

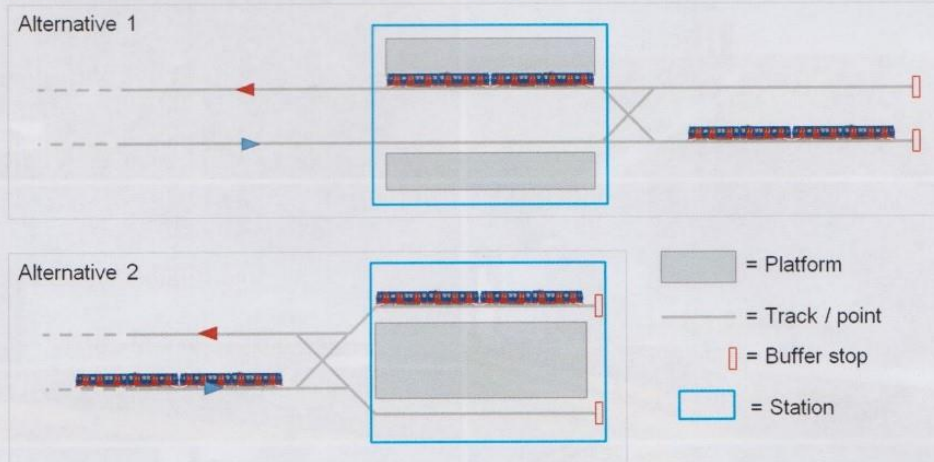


Which element of a standard turnout (see picture above) is the:

- frog (1..6)
- tongue or point (1..6)
- check rail (1..6)
- mathematical or intersection point (1..6)
- rear (1..6)

This is a ... [left / right] hand turnout, directing the train to the ... [left / right].

Q 10: Metro terminus station [12 points]



In a city (far far away and where everybody lives happily ever after) a new metro line is build. There are two alternatives for the terminus station at the end of the line.

What would your advice be taking in to account all the aspects? Motivate your advice.
N.B. It is a subterranean / underground station.