Academic year 2018/2019

Systems ENgineering Course

Exam: Analyse and characterise a system

Code & title's module	(1MAE003) – INTRODUCTION TO SYSTEMS ENGINEERING
Date	January 16, 2019
Duration	2 hours
Name	

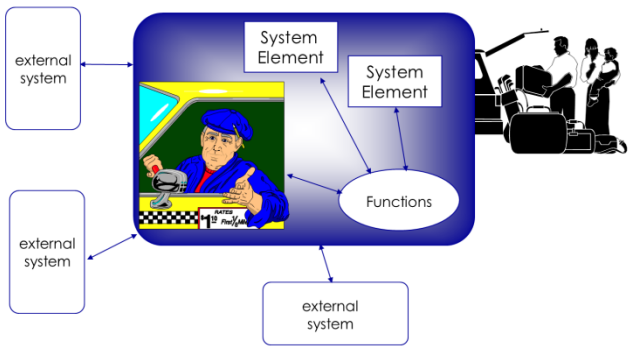
Open book, all documents are authorized

Mark scheme:

- Part I: 4 pts (20-30 min)
- Part II: 5 pts (20-30 min)
- Part III: 11 pts (40-50 min)

Part I – Understanding

Imagine a transportation system with a driver.



1. What is its purpose? *(0.25 pt)*
- ❒ A. to transport people, goods from one point to another
- ❒ B. to provide people transportation for various destinations
- ❒ C. to visit the cultural sites

2. What is its mission? *(0.25 pt)*
- ❒ A. to transport people, goods from one point to another
- ❒ B. to provide people transportation for various destinations
- ❒ C. to visit the cultural sites

3. What are its objectives? *(0.25 pt)*
- ❒ A. to transport 1 to 6 people at the same time
- ❒ B. to use electrical power engine
- ❒ C. to visit the cultural sites

4. Describe one operational scenario? *(0.5 pts)*

5. What is one function? *(0.25 pt)*
- ❒ A. to go to requested point
- ❒ B. to be on time
- ❒ C. to have 7 seats

6. What are the surrounding systems / objects? *(0.25 pt)*
- ❒ A. car, driver, engine
- ❒ B. traffic lights, fuel stations, roads
- ❒ C. government, hospital, museums

7. What are the physical system elements (components) of the system? *(0.25 pt)*
- ❒ A. car, driver, call center
- ❒ B. traffic lights, fuel stations, roads
- ❒ C. government, hospital, museums

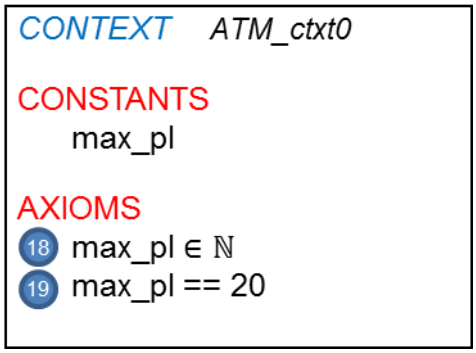
8. What are resources (necessary inputs in order it can achieve its mission)? *(0.25 pt)*
- ❒ A. car, driver, engine
- ❒ B. signal, wind, sun
- ❒ C. fuel, coins, food

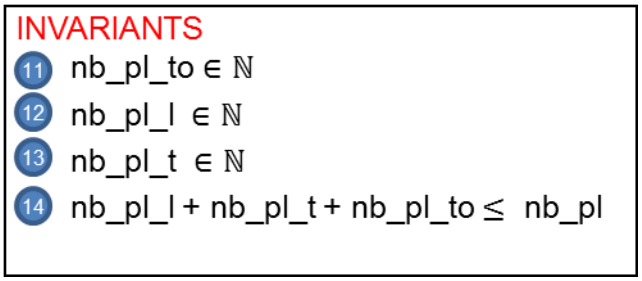
9. What are the constraints (physical limitations)? *(0.25 pt)*
- ❒ A. age, sea, city
- ❒ B. man, woman, goods
- ❒ C. weight, size, standards

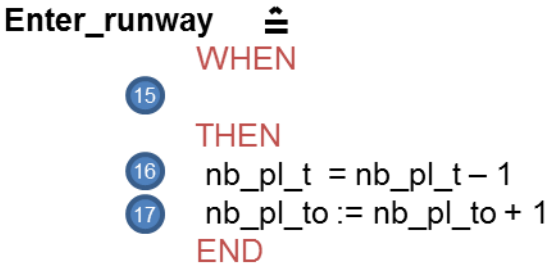
10. What could be the assets and drawbacks for using a formal method like Event-B? Justify, give other examples *(1.5 pts)*

Part II - Seminar remind

Let be the first refinement of the automatic airport controller, called ATM_mch1, together with its context.







1. Find the 4 errors, underline them (numbers in bullet) and then give the correct answers.
2. Knowing the glue invariant, we call it *inv_glue*,
    a. Write down the PO rule for **Enter_runway/ inv_glue /INV**
    b. (*bonus*) Give two inference rules that are helpful in order to discharge this PO.