

INSTITUTO SUPERIOR TÉCNICO
Air Traffic Management (GTA)
First semester 2021/2022
Exam (1.5 hour) - 24/Feb/2022

Name: _____

Number: _____

Notes:

- Read carefully each question before answering
- The answers should be given **exclusively** on these sheets (use both sides)
- The allowed consultation is limited to **5 (five) A4** sheets of paper
- For the multiple choice questions, a wrong answer is penalized with 1/4 of the question value

1. **[1 pt]** For this question refer to the chart provided.

The aeronautical chart provided in figure 1 is a

Final precision instrument approach (GLS – GNSS Landing System).

2. **[2 pt]** A passenger regular flight is being planned using a Boeing 757-200. The contingency fuel is the non-standard 3%. Given the following scenario:

Structural limited TOW:	115600 kg
Structural limited LW:	79000 kg
MZFW:	75000 kg
Performance limitation at the departing runway due to obstacles:	110000 kg
DOW:	50000 kg
FOB _{RAMP} :	31000 kg
Fuel _{TAXI} :	500 kg
Fuel _{TRIP} :	25000 kg

How much is the maximum payload that can be added to this flight?

MTOW Limited by LW = MLW+ Fuel_{TRIP} = 104000 kg

PL_{MAX} = MTOW – DOW - Fuel_{TO} = 23500 kg

3. **[2 pt]** Noise abatement procedures are a desirable situation to comply in order to minimize the environmental impact of departure and arrival aircrafts.

Give 4 examples of typical procedures to comply with this requirement that involve ATM, operational procedures, or both.

- **Continuous Descent Arrival (CDA) [ATM/OPS]**
- **Noise Abatement Departure Procedures (NADP) [ATM/OPS]**
- **Modified approach angles or displaced landing thresholds [ATM/OPS]**
- **Low power/low drag approach profiles [ATM/OPS]**
- **Noise preferred arrival and departure routes [ATM]**
- Noise preferred runways [ATM]
- APU management [ATM/OPS]
- Taxi power control [OPS]
- ...

4. **[2 pt]** Under radar control, consider the following ATC instruction:

“Técnico 007 climb FL370, QNH 1020, and proceed direct to EXAME”

The correct reply from the flight crew is:

- a) “Clear to climb FL 370, Técnico 007”
- b) “Clear to climb FL 370, QNH 1020, Técnico 007”
- c) “Clear to climb FL 370, QNH 1020, proceed direct to EXAME”
- d) “Clear to climb FL 370 and proceed direct to EXAME, Técnico 007”
- e) **None of the statements is correct.**

5. **[1 pt]** In Europe, airspace management within the Single European Sky airspace, is done in accordance with Regulation 2150/2005, the Flexible Use of Airspace

The basis for the FUA concept is that airspace should no longer be designated as either military or civil airspace, but should be considered as one continuum and used flexibly on a day-to-day basis. Consequently, any necessary airspace reservation or segregation should be only of a temporary nature. The FUA Concept uses airspace structures that are particularly suited for temporary allocation and/or utilisation such as *Conditional Routes* (CDRs), *Temporary Segregated Areas* (TSAs), *Temporary Reserved Areas* (TRAs). The status of these airspace structures is shared between civil and military. The information on active segregated areas, routes that are temporarily closed because of segregated areas, routes that are temporarily available because segregated area is not active is published daily in the *Airspace Use Plan* (AUP)

6. **[5 pt]** The following information is given about air traffic at a single runway an airport.

Aircraft type	Approach speed (knots)	Mix (%)	Runway occupancy time on landing (s)
Heavy (1)	137	20	60
Medium (2)	137	70	55
Light (3)	120	10	50

The length of the final approach to the runway is 8 NM. Aircraft can be classified in three types: Heavy (H), Medium (M) and Light (L)

The minimum separation requirements (in nautical miles) between successive landing aircraft on final approach are given by the matrix below (rows indicate leading aircraft and columns the following aircraft)

	1(H)	2(M)	3(L)
1(H)	4	5	6
2(M)	3	3	5
3(L)	3	3	3

Suppose the runway is used for arrivals only. Find the maximum throughput capacity for **arrivals**

Time Separation (sec)

		<i>Trailing aircraft</i>		
<i>leading aircraft</i>		1(H)	2(M)	3(L)
<i>aircraft</i>	1(H)	105	131	210
	2(M)	79	79	180
	3(L)	79	79	90

Probability of Leading/Trailing Pairs

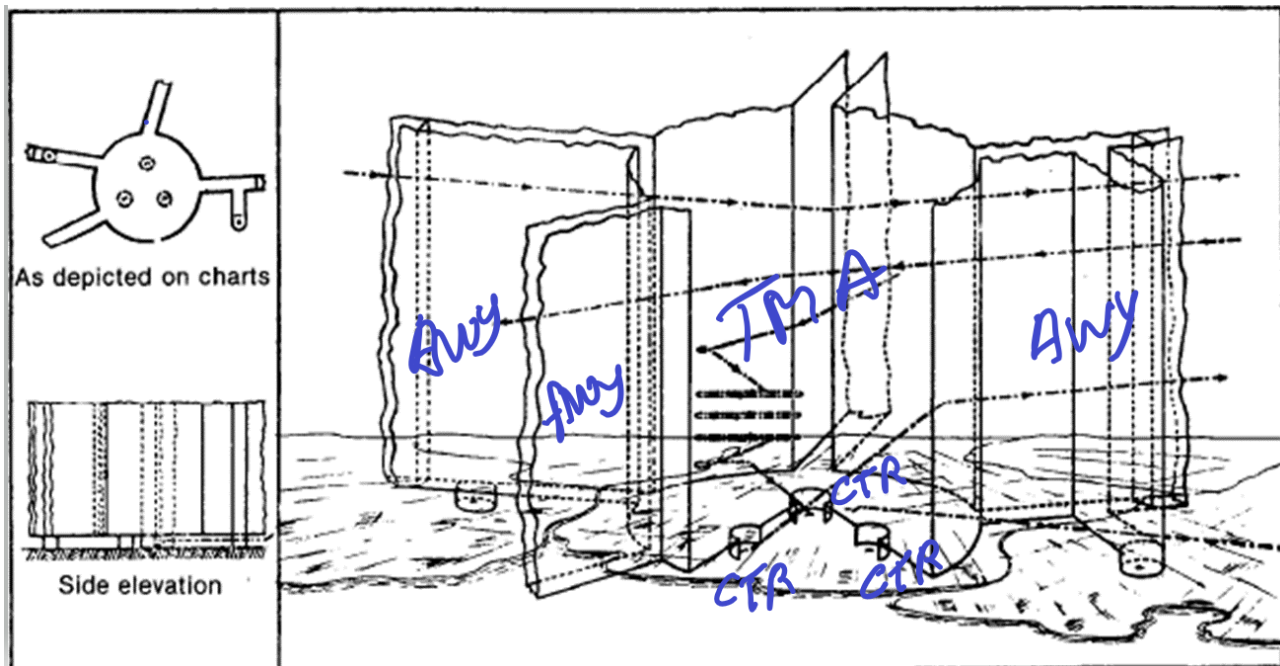
Trailing aircraft

<i>leading</i>		1(H)	2(L)	3(S)
<i>aircraft</i>	1(H)	0.04	0.14	0.02
	2(L)	0.14	0.49	0.07
	3(S)	0.02	0.07	0.01

Expected time separation 97.0

Average runway capacity 37.1

7. Consider the terminal airspace organization represented below



- a) [1 pt] Mark on the picture the CTRs, Airways and TMA.
b) [1 pt] Why does the lower limit of the airways has been established at a relatively high level to that of the TMA?

To give more freedom for operation of VFR flights below the airways.

8. [1 pt] When landing a seaplane, the aircraft heading should be
- along the water current
 - against the water current
 - along the wind
 - against the wind**
 - none of the above

9. [1 pt] Decode the following METAR (include the units in all values):

**KSFO 190756Z 32012G19KT 5SM SCT024 BKN038 BKN049 01/M01 A3002 RMK AO2
PK WND 31028/0657 SLP164 T00890044 401330072 \$**

Altimeter setting: **30.22 inHg**

Temperature: **1 °C**

Dew point: **-1 °C**

Wind speed: **12 KT with gusts 19 KT**

Wind direction: **320 °**

Issue date: **day 19 of the month**

Issue time: **7:56 UTC**

Cloud layer 1 (if any): **Scattered 2400 FT**

Cloud layer 2 (if any): **Broken 3800 FT**

Cloud layer 3 (if any): **Broken 4900 FT**

Cloud layer 4 (if any): **-**

Cloud layer 5 (if any): **-**

10. [1 pt] Complete the following sentence (all missing fields marked with “__”):

*Voice communications over the **HF** radio band (2850–22000 **K** Hz) involve three parties: the (1) pilot on the aircraft, the (2) ATCO on the ground, and (3) the radio operator on **ground**. Between (1) and (3) the communications are through voice, while between (2) and (3) are through text chat.*

11. [1 pt] Indicate the technologies used in SATCOM for the following operations:

ATC en-route instructions: **CPDLC**

Engine performance data: **ACARS**

Automatic terminal information service: **ACARS**

Surveillance: **ADS-B/C**

12. [1 pt] Complete the following sentence:

*In Secondary Surveillance Radar, to a Mode **C** interrogation the aircraft transponder responds with the altitude in **QNE**, in steps of **100** ft (resolution), which is coded in **11** bits.*