**Infraestructures del Transport Aeri (ITA)**
**Midterm Exam Fall semester 2018 -** Short Questions (5.5 exam points)

**Q1 [0.75 points]** In the context of air traffic management (ATM), briefly explain (3-4 lines) the main difference between "separation" and "collision avoidance"

**Q2 [0.75 points]** In the context of air traffic synchronisation in terminal airspace, briefly explain (3-4 lines) the advantages and drawbacks of "radar vectoring" and "tromboning".

**Q3 [0.75 points]** In the context of airspace management (ASM) in terminal airspace, briefly describe an illustrative example (4-5 lines) of a trade-off between capacity and efficiency.

**Q4 [0.75 points]** Why air traffic flow management (ATFM) is only useful if applied to a wide geographical area (such as Europe, China, U.S.A, …)? Briefly discuss in 4-5 lines.

**Q5 [0.5 points]** Briefly mention (1-2 lines each) an advantage and a shortcoming of the Automatic Dependent Surveillance.

**Q6 [2.0 points]** In the context of instrumental approach procedures, briefly explain the 4 following concepts. Clearly state who might or must calculate them and where these values shall or might be published (4-5 extra lines each): Minimum Descent Altitude; Decision Altitude; Runway Visual Range; Aerodrome Visibility

# INFRAESTRUCTURES DEL TRANSPORT AERI (ITA)
# Mid term Exam - FAll semester 2018

**Test [4.5 exam points]** **You have Permutation CODE 0 – GROUP 00**

For each question **only one** answer is correct: Correct: +1 test point - Incorrect: -1/3 test points - No answer: 0 points

1. Airspace Management (ASM) is NOT responsible for:
   (a) civil-military coordination.
   (b) designation of airspace types or classes.
   (c) air traffic flow management.
   (d) the design of the ATS route network.
2. Airspace management (ASM) initiatives or strategies are usually:
   (a) implemented in real time by the initiative of the supervisor of an ATC center.
   (b) implemented in real time by the initiative of an air traffic controller.
   (c) proof mathematically and solved analytically.
   (d) tested by several fast-time simulations and studies.
3. A VFR aircraft is cruising with heading $130^o$. According to the ICAO flight level allocation scheme (*odd-even* rule), a possible flight level for this flight could be:
   (a) FL130
   (b) FL135
   (c) FL140
   (d) VFR flights do not fly using flight levels, but using Altitudes.
4. During a descent, when the pilot reaches the transition level, he/she shall...
   (a) change the altimeter setting from QNH to STD.
   (b) change the altimeter setting from STD to QNH.
   (c) change the altimeter setting from QFE to STD.
   (d) do nothing in particular regarding the altimeter setting.
5. What features are taken into account when designing the size and shape of ATC sectors?
   (a) Long term traffic demand and its complexity.
   (b) Number of historical incidents a particular aircraft type had.
   (c) Actual weather conditions and short term (i.e. next hour aproximatelly) traffic complexity.
   (d) All answers are correct.
6. What is an airspace opening scheme?
   (a) It defines how the shape of the sector assigned to a specific air traffic controller will change along the day.
   (b) It defines the sequence of different sector configurations planned along the day.
   (c) It defines the number of open sectors at the begining of the day.
   (d) It defines the maximum number of open sectors along the day.
7. Schedule (or IATA) slots...
   (a) are defined in European airpots twice a year.
   (b) are defined early in the morning in European airports.
   (c) are defined early in the morning in European airports, only if there is a demand/capacity imbalance.
   (d) are defined by the CFMU at any time when a demand/capacity imbalance exists.
8. An airspace sector has been regulated and its maximum capacity is set to 6 aircraft per hour. Table 1 depicts the Estimated Time Over (ETO) the concerned sector for a given set of aircraft. What is the ATFM delay that would be assigned to AZA164 according to the computed assisted slot allocation (CASA) algorithm?

**Table 1**

| Flight | ETO | Flight | ETO |
|---|---|---|---|
| RYR23A | 10:01 | IBE43R | 10:24 |
| DAL982 | 10:06 | ICC956 | 10:40 |
| AFR123 | 10:07 | SIA543 | 11:02 |
| AZA164 | 10:11 | BER122 | 11:05 |

   (a) No delay.
   (b) 1 minute.
   (c) 4 minutes.
   (d) 19 minutes.
9. Taking into account the previous question, what is the ATFM delay that would be assigned to BER122 according to the computed assisted slot allocation (CASA) algorithm?
   (a) No delay.
   (b) 1 minute.
   (c) 5 minutes.
   (d) 10 minutes.
10. Taking into account the previous question, w what is the ATFM delay that would be assigned to ICC956 according to the computed assisted slot allocation (CASA) algorithm?
   (a) No delay.
   (b) 1 minute.
   (c) 5 minutes.
   (d) 10 minutes.
11. Taking into account the previous question, what is the ATFM delay that would be assigned to SIA543 according to the computed assisted slot allocation (CASA) algorithm?
   (a) No delay.
   (b) 2 minutes.
   (c) -2 minutes.
   (d) 1h and 2 minutes.
12. Pre-tactial ATFM should:
   (a) Balance flights next day with available ATC Capacity.
   (b) Match long-term demand and needed ATC capacity.
   (c) Manage current flights with existing ATC capacity.
   (d) Define the national airspace policy and predetermined airspace structures.
13. Tactical ATFM should:
   (a) Balance flights next day with available ATC Capacity.

(b) Match long-term demand and needed ATC capacity.

(c) Manage current flights with existing ATC capacity.

(d) Define the national airspace policy and predetermined airspace structures.

14. Which of the following CFMU systems can provide historical data to generate future possible demand scenarios?

(a) The DWH

(b) The EAD

(c) The ENV

(d) The RCAT

15. Which of the following CFMU systems deals with the flight plans sent by aircraft operators?

(a) The IFPS

(b) The ETFMS

(c) The ENV

(d) The RCAT

16. Which physical transmission layer is mainly used for ATC communications when aircraft are flying over populated continental regions?

(a) A Very high frequency (VHF) subnetwork.

(b) Satellite communication.

(c) A High Frequency (HF) subnetwork.

(d) All answers are correct.

17. Which of the following statements is true?

(a) ACARS uses CPDLC to transmit controller-pilot communication messages (*).

(b) CPDLC permits, amongst other things, the communication between pilots and flight operation centres (FOC) (*).

(c) Both answers labelled with a (*) are correct.

(d) None of the answers is correct.

18. What is the main consequence of **not** having atomic clocks in GPS receivers?

(a) We need at least a fourth satellite to calculate the position of the receiver.

(b) We need at least a fifth satellite to calculate the position of the receiver.

(c) All GPS receivers, in fact, are equipped with atomic clocks.

(d) None of the other answers is correct.

19. Which of these statements is correct:

(a) The SBAS geostationary satellites compute the position of the user receiver (like, for instance an aircraft) and send this information to this user with at least 4 satellites to ensure a certain level of redundancy.

(b) The SBAS geostationary satellites send to the user receiver different kinds of information, which are then used by this receiver to improve integrity and accuracy in the positioning.

(c) The SBAS geostationary satellites only mimic the GPS satellites in order to improve the availability of the system.

(d) The SBAS geostationary satellites provide advanced features such as ADS-B in remote areas (like oceans).

20. Who actually computes a GPS position?

(a) The receiver, using the information sent by the GPS satellites.

(b) One or more GPS satellites, using the information sent by the receiver.

(c) The GPS ground station, using the information sent by the receiver via the GPS satellites.

(d) The receiver and at least 4 GPS satellites: the receiver computes the 3D coordinates and the satellites compute the different time stamps.

21. Which is the **main reason** that explains why the aviation industry has developed ground or satellite based augmentation systems for GPS?

(a) in order to enhance GPS positioning accuracy.

(b) in order to meet the requirements for integrity and continuity of service needed in civil aviation.

(c) in order to enhance navigation capabilities in oceanic or remote areas.

(d) in order to augment the coverage of GPS.

22. Which of the following surveillance systems can detect an aircraft that is not willing to "cooperate"?

(a) The primary surveillance radar.

(b) The secondary surveillance radar.

(c) The ADS.

(d) The TCAS

23. A circling to approach...

(a) is the same than a non precision approach.

(b) is the same than an APV approach.

(c) is an approach that cannot be considered as a straight-in approach.

(d) is only for approaches where the final approach segment has a miss-alignment of 15 degrees or more.

24. A circling to approach with prescribed tracks...

(a) consists of a sequence of visual tracks that guide the pilot when flying the circling procedure.

(b) consists of a sequence of instrumental tracks that guide the pilot when flying the circling procedure.

(c) consists of a sequence of visual tracks to be avoided by the pilot when flying the circling procedure.

(d) consists of a sequence of instrumental tracks to be avoided by the pilot when flying the circling procedure.

25. An approach procedure only using a Localiser as principal guidance system in the final approach segment is...

(a) a precision approach.

(b) a non-precision approach.

(c) an APV approach.

(d) a Localiser cannot be used as principal guidance system in the final approach segment.

26. The OCA...

(a) is the minimum descent altitude for VFR flights.

(b) is the lowest altitude the pilot should have a clear view of the runway or airport, otherwise a missed approach procedure must be initiated.

(c) is the altitude from which a procedure becomes a Non Precision Approach.

(d) None of the other answers are correct.

27. When establishing the laning minima, the operator must take into account:

(a) the dimension and characteristics of the runways (*).

(b) the adequacy and performance of the available visual and non-visual ground aids (*).

(c) Answers marked with (*) are correct.

(d) None of the other answers are correct.

28. When executing an approach procedure, in which case the pilot can proceed below the published MDA?

(a) only if executing a precision approach procedure.

(b) only when the MAPt has been overflown.

(c) only when the pilot has visual contact with the runway AND decides to land.

(d) only when the FAF has been overflown.

29. In which case you could find an approach procedure with no decision height?

(a) In an E category approach.

(b) In a Heavy category approach.

(c) In an ILS CAT-III approach.

(d) In a circling to approach.

30. Given a specific runway, which of the following approaches will lead (in general) to the highest MDA or DA?

(a) a VOR circling to approach procedure.

(b) a VOR straight-in approach procedure.

(c) a ILS CAT-I straight-in approach procedure.

(d) a ILS CAT-II straight-in approach procedure.

31. In navigation, the track angle is defined as:

(a) the azimuthal angle between the wind and the aircraft heading.

(b) the azimuthal angle of the ground speed vector.

(c) the azimuthal angle of the true airspeed vector.

(d) None of the other answers is correct.

32. The Visual Flight Rules (VFR) airfield traffic pattern leg by which an aircraft flies perperdicular to the runway and starts descending is called:

(a) upwind.

(b) crosswind.

(c) downwind.

(d) base.

33. Imagine an twin engine aircraft departing in IMC from a controlled airport. Few seconds after take-off, it hits birds, which cause a fire in one of the engines and loosing all of its power. In this situation, the **navigate** function of the aircraft crew would be:

(a) to check if there is a contingency departure published for that airport and execute it.

(b) to safely control the aircraft trajectory with the loss of power and to manage to extinguish the fire and shut down the engine.

(c) to revert to manual control and visual flight to safely land as soon as possible.

(d) to send a distress message to the air traffic control.

34. Which of the following aircraft instruments are mainly used to perform the *aviate* function in IMC conditions?

(a) the VOR, the ADF (NDB receiver) and the DME.

(b) the artificial horizon, the airspeed indicator and the altimeter.

(c) the *aviate* function is always executed visually and no instruments are required.

(d) all engine related instruments.

35. Which of the following sentences is correct?

(a) In IMC an aircraft can fly according to IFR or VFR.

(b) In VMC an aircraft must always fly according to IFR.

(c) In VMC an aircraft must always fly according to VFR.

(d) None of the other answers is correct.

36. ICAO regulations classify the aircraft according to their wake turbulence as:

(a) Heavy, Medium and Light.

(b) A, B, C, D, E and H.

(c) CAT-I, CAT-II, CAT-IIIa, CAT-IIIb and CAT IIIc.

(d) APV-I and APV-II.

37. What it is the most important element to operate in RVSM (reduced vertical separation minima) space?

(a) An accurate 3D radar.

(b) A certified altimeter.

(c) Certified instrumental en-route charts.

(d) A certified radio-navigation system.

38. When talking about the Short Term Conflict Alert (STCA) system, which of the following statements **is wrong**?

(a) The STCA function alerts the controller to potential aircraft to aircraft collisions prior to loss of separation.

(b) The STCA does not take into account the possible clearances given to the aircraft.

(c) Future aircraft positions are estimations based on the velocity vectors of the aircraft.

(d) The STCA communicates with the on-board TCAS and when a TCAS alarm triggers, also does the STCA alarm and vice-versa.

39. The TCAS II (Traffic Collision Avoidance System II) uses for its operation:

(a) both the replies from the transponders of other aircraft and the ground based radar echoes.

(b) the echoes of collision avoidance radar system especially installed on board.

(c) the echoes from the ground air traffic control radar system.

(d) the replies from the transponders of other aircraft.

40. Which of the following statements is true regarding TCAS?

(a) TCAS provides separation provision between aircraft.

(b) TCAS is a non-cooperative collision avoidance systems.

(c) TCAS is a cooperative collision avoidance system.

(d) None of other answers is correct.

# INFRAESTRUCTURES DEL TRANSPORT AERI (ITA)
## Mid Term Exam - Fall semester 2018

Correct answers

| Pregunta | CODE 0 | CODE 1 | CODE 2 | CODE 3 |
|---|---|---|---|---|
| P 01 | c | d | b | a |
| P 02 | d | a | c | b |
| P 03 | b | b | a | b |
| P 04 | b | b | d | b |
| P 05 | a | a | d | c |
| P 06 | b | a | c | c |
| P 07 | a | a | a | a |
| P 08 | d | c | b | a |
| P 09 | c | a | b | c |
| P 10 | d | a | a | d |
| P 11 | a | c | c | c |
| P 12 | a | b | a | c |
| P 13 | c | c | d | d |
| P 14 | a | b | b | a |
| P 15 | a | b | c | a |
| P 16 | a | d | a | a |
| P 17 | d | d | c | c |
| P 18 | a | b | c | d |
| P 19 | b | a | d | c |
| P 20 | a | a | a | b |
| P 21 | b | a | c | a |
| P 22 | a | d | a | d |
| P 23 | c | b | d | b |
| P 24 | a | c | d | b |
| P 25 | b | a | a | b |
| P 26 | d | d | c | d |
| P 27 | c | d | d | d |
| P 28 | c | a | c | c |
| P 29 | c | a | c | a |
| P 30 | a | c | b | a |
| P 31 | b | b | b | b |
| P 32 | d | c | a | b |
| P 33 | a | c | a | c |
| P 34 | b | c | a | a |
| P 35 | d | a | c | c |
| P 36 | a | a | b | c |
| P 37 | b | d | a | b |
| P 38 | d | a | b | b |
| P 39 | d | d | d | d |
| P 40 | c | d | d | d |