



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2016/2017**

**TERBUKA**

COURSE NAME : ENVIRONMENTAL IMPACT  
OF AVIATION

COURSE CODE : BDL 30402

PROGRAMME : 3BDC

EXAMINATION DATE : DECEMBER 2016 / JANUARY 2017

DURATION : 2 HOURS

INSTRUCTION : ANSWER **FOUR (4)**  
QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

- Q1**
- (a) Annual market forecasts published by Airbus and Boeing are produced based on two dissimilar models.
- (i) Define the models.
  - (ii) Differentiate the approach taken by each model.
  - (iii) Discuss the consequence of each approach towards environment.
- (10 marks)
- (b) Aircraft emissions are continuously increasing and projected to continue to rise with aviation growth. The growth can be referred to the expansion of the industry itself as measured by some standardized manner. Give three (3) categories of these standard measures.
- (3 marks)
- (c) Relate the emission of nitrogen oxides (NO<sub>x</sub>) towards its environmental impact at upper and lower atmosphere.
- (6 marks)
- (d) Describe three (3) challenges that are currently encountered by the aviation industry in mitigating the impact of its operation towards environment.
- (6 marks)
- Q2**
- (a) Define 'radiative forcing' and describe its significance to climate change.
- (4 marks)
- (b) An Airbus A380 with 65% load factor is scheduled to take off from London Heathrow Airport to Kuala Lumpur International Airport.
- (i) Explain how that single flight can affect climate change in the order of instantaneous effect, weeks, years and decades.
  - (ii) Discuss the implication of a load factor towards the environmental impact of aircraft operations.
  - (iii) By focusing on the operational perspective, propose four (4) actions that can be taken by the airline to reduce its contribution to climate change.
- (15 marks)
- (c) Increasing amount of greenhouse gas concentrations contributes to the increase of Earth's average temperature. Describe three (3) potential impacts of this situation towards flight performance.
- (6 marks)

- Q3** (a) For a certification purpose, an aircraft is expected to satisfy several regulatory standards as part of the ambitious effort to reduce emissions through market-based approach.
- (i) Explain one of the available emission standards and types of aircraft covered by that standard.
  - (ii) Explain the meaning of 'technology forcing' and 'technology feasible' with reference to the approach taken by ICAO in producing its emissions and noise standards.
- (10 marks)
- (b) The issue of sustainability always arise when it comes to the use of biofuels. Describe two (2) sustainability challenges faced by the industry to replace the conventional jet fuels with biofuels.
- (6 marks)
- (c) The application of drop-in alternative fuels have been identified as a potential solution to reduce the environmental impact of aviation.
- (i) Describe the condition for a fuel to be considered as 'drop-in'.
  - (ii) Briefly explain two (2) processing routes that have been approved by ASTM to produce drop-in fuels for aviation usage and provide suitable feedstock for each process.
- (9 marks)
- Q4** (a) Differentiate the combustion and non-combustion infrastructure source of emissions that affect local air quality at the airport vicinity area. The explanation should include two (2) example of each source.
- (8 marks)
- (b) Define emission inventories and give three (3) examples of its usage.
- (5 marks)
- (c) Air quality has been an important limiting factor for many airport development projects. Discuss the reasons.
- (4 marks)
- (d) Propose four (4) solutions that can be taken up by an airport to improve air quality.
- (8 marks)

- Q5** (a) While the noise associated with individual aircraft movements is tend to decline due to technological and operational improvements, the frequency with which people are being exposed to aircraft noise is increasing.
- (i) Explain the reason that could lead to the above mentioned situation.
  - (ii) The source of aircraft noise can be categorized into two (2) categories. Define the categories and provide an example of each.
  - (iii) Discuss two (2) main elements of aircraft noise nuisance.
  - (iv) Describe two (2) effects of aircraft noise.
- (14 marks)
- (b) ICAO has introduced a guideline on aircraft noise that can be found in the ICAO Doc 9829, Guidance on the Balanced Approach to Aircraft Noise Management.
- (i) Define the significance of having a concept of balanced approach to address noise problem at airports.
  - (ii) List all four (4) principal elements of this concept.
- (7 marks)
- (c) Describe the primary purpose of having aircraft noise certification standard as well as the implication of its implementation.
- (4 marks)

- END OF QUESTION -

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