
UNIVERSITI SAINS MALAYSIA

First Semester Examination
2007/2008 Academic Session
*Peperiksaan Semester Pertama
Sidang Akademik 2007/2008*

October/November 2007
Oktober/November 2007

ESA 342/3 – Propulsion Systems
Sistem Dorongan

Duration : 3 hours
[Masa : 3 jam]

INSTRUCTION TO CANDIDATES

ARAHAN KEPADA CALON

Please ensure that this paper contains **TWELVE (12)** printed pages and **FIVE (5)** questions before you begin examination.

*Sila pastikan bahawa kertas soalan ini mengandungi **DUA BELAS (12)** mukasurat bercetak dan **LIMA (5)** soalan sebelum anda memulakan peperiksaan.*

Part A: Answer **ALL** questions. Part B: Answer **ALL** questions.

*Bahagian A: Jawab **SEMUA** soalan. Bahagian B: Jawab **SEMUA** soalan.*

Student may answer the questions either in English or Bahasa Malaysia.

Pelajar boleh menjawab soalan dalam Bahasa Inggeris atau Bahasa Malaysia.

Each questions must begin from a new page.

Setiap soalan mestilah dimulakan pada mukasurat yang baru.

PART A/BAHAGIAN A

1. (a) Explain the mechanism of thrust generated by the following type of aircraft engine : (1) turbojet, (2) turbofan and (3) turboprop.

Terangkan bagaimana caranya daya dorongan dihasilkan pada mesin pesawat terbang tipe: (1) turbojet (2) turbofan dan (3) turboprop.

(6 marks/markah)

- (b) Explain meaning of the following term:

Terangkan apa yang dimaksudkan dengan istilah berikut:

- (i) Specific thrust fuel consumption STFC and Specific thrust consumption SFC

"Specific thrust fuel consumption" STFC dan "Specific thrust consumption" SFC

- (ii) By pass ratio α

"By pass ratio" α

- (iii) Explain why the ramjet engine just can be used for the supersonic airplane?

Terangkan mengapa mesin ramjet hanya digunakan pada pesawat terbang pada halaju supersonik?

(6 marks/markah)

- (c) With assumption that an ideal condition is valid for the flow past through the turbojet engine components, shows that the fuel air ratio f would be:

Dengan anggapan bahawa kondisi ideal berlaku ketika aliran melalui komponen-komponen mesin pesawat turbojet, tunjukkan bahawa "fuel air ratio" f adalah:

$$f = \frac{c_p T_0}{h_{pr}} [\tau_\lambda - \tau_r \tau_c]$$

(4 marks/markah)

and the exit velocity from the Nozzle of turbojet is:

dan halaju aliran keluar dari muncung turbojet adalah:

$$\left(\frac{V_9}{a_0}\right)^2 = \frac{2}{\gamma-1} \frac{\tau_r}{\tau_\lambda} [\tau_r \tau_c \tau_t - 1]$$

where:

di mana:

C_p : Heat coefficient at constant pressure
Pemalar panas pada tekanan tetap

T_0 : Free stream temperature
Suhu udara aliran bebas

a_0 : Free stream sound speed
Kecepatan suara aliran bebas

h_{pr} : Fuel heating value
Nilai panas bahan bakar

τ_λ : The ratio of the burner exit to the ambient enthalpy
Nisbah entalpi "burner exit" terhadap entalpi persekitaran

τ_c : The temperature ratio of compressor component
Nisbah suhu komponen kompresor

τ_t : The temperature ratio of turbine component
Nisbah suhu komponen turbin

τ_r : The temperature ratio of the free stream
Nisbah suhu aliran bebas

(4 marks/markah)