KUMARAGURU
college of technology
character is life

B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fifth Semester

AERONAUTICAL ENGINEERING

U18AEI5205**:** Aircraft Propulsion

COURSE OUTCOMES

CO1: Analyze overall performance of an aircraft engines.
CO2: Explain the relation between area ratio and external deceleration ratio for diffuser.
CO3: Describe the combustion mechanisms of gas turbine engine.
CO4: Calculate the operating characteristics of compressors, turbines and nozzles.
CO5: Experiment the performance of aircraft engine components.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	What are the various factors affecting thrust?	CO1	[K$_2$]
2.	Define Bypass ratio.	CO1	[K$_1$]
3.	Write down any two requirements of an aircraft intake.	CO2	[K$_1$]
4.	What is "buzz" in supersonic inlets?	CO2	[K$_2$]
5.	Define combustion intensity.	CO3	[K$_1$]
6.	Define slip factor and degree of reaction.	CO4	[K$_1$]
7.	Distinguish between impulse and reaction turbines.	CO4	[K$_2$]
8.	Why the after-burner engine required variable area nozzle?	CO4	[K$_2$]
9.	What is meant by De Laval nozzle?	CO5	[K$_1$]
10.	List the various losses in a nozzle	CO5	[K$_2$]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	In a turbojet with forward facing ram intake, the jet velocity relative to the propelling nozzle at exit is twice the flight velocity. Determine the rate of fuel consumption in kg/s when developing a thrust of 25000N under the following conditions.	16	CO1	[K$_3$]

Ambient pressure and temperature :0.7 ;1^{O}C

Compressor pressure ratio:5:1

Flight speed :800 km/h

Calorific value of fuel:42000 kJ/kg

Inlet efficiency :100%

Isentropic efficiency of compressor:85%

Isentropic efficiency of turbine:90%

Isentropic efficiency of nozzle:95%

Combustion efficiency :98%

Turbine pressure ratio :2.23

Assume mass flow of fuel is small compared with mass flow of air and that working fluid throughout has the properties of air at low temperature .Neglect the pressure drop .Assume Cpa=Cpg=1.005 kJ/kgK

12.		With neat sketch explain about the starting problems in supersonic inlets .	16	CO2	[K$_3$]
13.	a)	Explain the basic requirements of a combustion chamber.	08	CO3	[K$_2$]
	b)	With neat sketch explain the working principle of combustion chamber.	08	CO3	[K$_2$]
14.	a)	With neat sketch explain the working principle of axial flow compressors.	08	CO4	[K$_2$]
	b)	Write a short notes on the following compressor Phenomenon. i) Surge ii) Stall	08	CO4	[K$_2$]
15.	a)	With neat sketch briefly discuss about the various methods of turbine blade cooling.	08	CO4	[K$_2$]
	b)	Describe briefly matching procedures for turbine and compressor.	08	CO4	[K$_2$]
16.	a)	Describe the phenomenon of under-expansion, over-expansion and optimal expansion in nozzles with appropriate diagrams.	08	CO5	[K$_2$]
	b)	Discuss the various thrust reversal mechanisms used in jet engines.	08	CO5	[K$_2$]

****