Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Fourth Semester

AERONAUTICAL ENGINEERING

U15AET404: Aircraft Propulsion

COURSE OUTCOMES

CO1: Analyze thermodynamics of an aircraft jet engine and calculate the performance measures, such as thrust and specific fuel consumption in terms of design requirement.

CO2: Estimate the best possible engine performance as a function of principal design parameters, such as maximum engine temperature, pressure ratio, and flight speed.

CO3: Analyze the internal mechanisms of gas turbine engine components and understand the factors that limit the practical performance of inlets, combustion chambers, and nozzles.

CO4: Evaluate the operating characteristics of compressors and turbines in terms of given blade shapes, angles, and direction of rotation.

CO5: Design a gas turbine engine using the understanding of the relationship between components, at least at the level of selecting the number of spools and stages.

CO6: Calculate the design thrust and overall efficiency of turbojet and turbofan engines, with and without afterburners, from given component performance.

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. CO1 [K_1]

List I	List II
A. Air breathing engine	i. Ramjet
B. Non-zero altitude starting engine	ii. Turbojet
C. Can type	iii. Combustion
D. Over-expansion	iv. Nozzle

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	iv

2. For an Air- breathing Engine the following is true CO1 [K_1]

a) Thrust increases slightly with altitude
b) Thrust decreases with altitude
c) Engine has no ram drag; constant thrust with speed.
d) No altitude limitation

3. The following statements are true, CO2 [K_2]

1. Reducing the velocity and increasing the static pressure of a fluid passing through
2. A supersonic diffuser is a duct that decreases in size in the direction of flow
3. Diffuser is not integrated with compressor.
4. Inlets acts as a diffuser in most cases.

a) 1,3
b) 1,4
c) 1,2
d) 2,3

4. A subsonic diffuser is a duct that _____ in the direction of flow CO2 [K_2]

a) No change in area
b) decreases in size
c) increases in size
d) None

5. Assertion (A): The compressor is linked with the turbine. CO3 [K_2]

Reason (R): The turbine supplies power to the compressor.

a) Both A and R are Individually true and R is the correct explanation of A
b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

6. One factor that affects the combustor design is CO3 [K_2]

a) Chocking
b) Blow out
c) Flame stabilization
d) None

7. The sequence of engine components will be CO4 [K_3]

1. Compressor
2. Turbine
3. Combustor
4. Nozzle

a) 2-3-4-1
b) 1-3-2-4
c) 3-4-2-1
d) 4-1-3-2

8. There are _____ types of combustion chamber CO4 [K_3]

a) 2
b) 3
c) 4
d) 8

9. Assertion (A): Turbine blade cooling is necessary because, CO5 [K_2]

Reason (R): High temperature from the combustor will affect the material.

a) Both A and R are Individually true and R is the correct explanation of A

b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

10. _____ acts as a thrust brake CO5 [K_2]

a) Thrust vector

b) Thrust impinge

c) Thrust Reversal

d) None

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. Name the two types of engine categories based upon its performance. CO1 [K_2]
12. Why Ramjet engines are not used for ground run purpose? CO1 [K_2]
13. List the types of inlets. CO2 [K_2]
14. What is stall? CO2 [K_2]
15. How does an axial compressor differ from the centrifugal compressor? CO3 [K_2]
16. What is Degree of reaction? CO3 [K_2]
17. What is flame stabilization? CO4 [K_2]
18. Define combustion intensity. CO4 [K_2]
19. Define Electro negativity. CO5 [K_2]
20. What is De-laval nozzle CO5 [K_2]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. Explain in detail about the various types of engines used in the field of aerospace engineering with neat sketches. CO1 [K_2]

22. Derive a relation between Amax/Ai and external deceleration ratio ui/ua for a subsonic inlet. CO2 [K_3]

23. Describe construction details of an axial flow compressor with the help of neat diagram and its operating principle. CO2 [K_3]

24.	a) Explain about the important factors affecting the combustion chamber design.	(10)	CO3	[K_2]
	b) Mention in detail about the various types of combustion chambers.	(4)		
25.	Briefly discuss the methods of turbine blade cooling and mention its advantages and disadvantages.		CO4	[K4]
26.	a) Explain about the performance of a turbofan engine with		CO1	[K_4]
	i) Bypass	(5)		
	ii) Afterburner	(5)		
	b) Brief about the working principle of a ramjet engine.	(4)		
27.	Explain in detail the Thrust reversal of a jet engine.		CO5	[K_5]

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