Register Number:……..

KUMARAGURU
college of technology
character is life

B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Seventh Semester

MECHANICAL ENGINEERING

U18MEE0010**:** Gas Dynamics and Jet Propulsion

COURSE OUTCOMES

CO1: Explain the effect of Mach Number on compressibility
CO2: Solve the area ratio for nozzle and diffuser for subsonic and supersonic flow conditions
CO3: Solve the problems in Rayleigh and Fanno flow for constant area sections
CO4: Explain the concept of normal shock for an isentropic flow
CO5: Discuss the performance of turbo jet, ram jet and pulse jet engines
CO6: Calculate the performance of rocket propulsion systems

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 is Mach waves?	CO1	[K_2]
2.	Illustrate Mach cone for a supersonic flow	CO1	[K_2]
3.	Formulate the non dimensional form of Reyleigh flow relation for impulse function	CO2	[K_2]
4.	Define Fanning's coefficient of skin friction	CO2	[K_2]
5.	Write the governing equations for the gas velocity at the maximum entropy point on the Fanno line.	CO3	[K_2]
6.	List the assumptions used to form the basis of various equations relating to the flow parameters on the two sides of the shock	CO3	[K_2]
7.	Define propulsive efficiency	CO4	[K_2]
8.	List the advantages of the turbofan engines	CO5	[K_2]
9.	Classify the types of rocket engines based on source of energy employed and based on number of stages	CO6	[K_2]
10.	Compare the uses of propellant mass fraction and mass ratio in space flights	CO6	[K_2]

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

11.	Discuss the effect of Mach number on compressibility	16	CO1	[K_3]

12.	The pressure, temperature and Mach number at the entry of a flow passage are 2.45 bar 26.5 degrees Celsius and 1.4 respectively. If the exit Mach number is 2.5, determine for adiabatic flow of a perfect gas (γ= 1.3, R= 0.469 kJ/kg-k) i) temperature and velocity of gas at exit ii)the flow rate per square metre of the inlet cross section iii) stagnation temperature	16	CO2	[K_4]
13.	Air enters a long circular duct of diameter 12.5 cm (f=0.0045) at a Mach number of 0.5, pressure 3 bar and temperature 312 K. If the flow is isothermal throughout the duct determine i) the length of the duct record to change the Mach number to 0.7 ii) pressure and temperature of air at M= 0.7, iii) the length of the duct required to attain limiting Mach number and iv)state of air at the limiting Mach number	16	CO3	[K_4]
14.	Explain Prandtl Meyer relation in detail	16	CO4	[K_3]
15.	Discuss the working of turbo and ram jet engines in detail	16	CO5	[K_3]
16.	Classify rocket engines on the basis of propellants used and explain the working principle	16	CO6	[K_2]

****