Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 - 20 Examination

Semester: 5 **Date: 03/12/2019**
Subject Code: 03101330 **Time: 10:30 am to 01:00pm**
Subject Name: GAS DYNAMICS **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) **(15)**

1. When mach number is less than 1 flow is _____
a) Subsonic flow
b) Transonic flow
c) Supersonic flow
d) None of the mentioned

2. For compressible flow mach number must be _____ 0.3
a) less than
b) equal to
c) greater than
d) none

3. Nozzles are used to control the _____
a) temperature
b) rate of flow
c) mass flow rate
d) none of the mentioned

4. Nozzle used in rocket engine is _____
a) convergent nozzle
b) divergent nozzle
c) convergent – Divergent nozzle
d) none of the mentioned

5. In a shock tube:
a) p and Mach are continuous across contact discontinuity
b)entropy s is constant through expansion and contact discontinuity
c) p and U are continuous across contact discontinuity
d)Mach of the flow behind shock cannot be M>1

6. When mach number is in between 1.2 - 5, flow is in_____
7. what is under-expanded nozzle?_____
8. The integral form of continuity equation is_____
9. When Mach number > 0.3, flow is_____
10. The actual temperature of the fluid in a particular state is known as_____
11. A plane travels at a speed of 2400 KM/h in an atmosphere of 5°C, find the mach angle._____
12. Find the sonic velocity in oxygen when it is at 110° C, g=1.4_____
13. A steady one-dimensional flow in a constant area duct with friction in the absence of Work and heat transfer is known as_____
14. The mass flow rate is maximum at the critical state and is constant afterwards, then the flow is said to be_____
15.compressibility equation at constant temperature(isothermal compressibility)_____

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Differentiate between Fanno flow and Rayleigh flow.

B) What is chocked flow? State the necessary critical conditions for this flow to occur in a nozzle associated with pressure, temperature, velocity and density.

B) i)what is stagnation condition? And also write stagnation condition of pressure, temperature and density.

ii) Derive A/A* ratio

D) Explain attached – detached shock.

Q.3 A) Compulsory **(07)**

i)derive area velocity and mach number relation with all cases

ii)derive rankine- hugonoit equation

B) **(08)**

i) What is difference between oblique and normal shock?

ii) What is difference between convex corner and concave corner?

iii) What is compressible flow and also what is compressibility?

OR

B) **(08)**

What is shock tube and also explain shock interaction and shock reflection with neat diagram.

Q.4 A) **(07)**

Derive normal shock relation along with prandtle- meyer relation.

OR

A) (**07**)

Derive oblique shock relation along with θ-β-M equation RELATION

B) Compulsory **(08)**

Air flows isentropically through a C.D. The inlet conditions are pressure 700 KN/m2, temperature 320oc, velocity 50 m/s. The exit pressure is 105KN/m2 and the exist Area is 6.25 cm2. Calculate

i) Mach number, temperature and velocity at exit

ii) Pressure, temperature and velocity at throat

iii) Mass flow rate

iv) Throat area