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**Reg. No. : .....**

**Name : .....**

**Seventh Semester B.Tech. Degree Examination, October 2014**
**(2008 Scheme)**
**08.703 : GAS DYNAMICS (M)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *Answer **all** questions from Part **A** and **one full** question, from **each** Module of Part **B**. **Use** of gas tables are **permitted**.*

PART – A

1. Define M* and write its significance.
2. Derive the law of conservation of mass for a control volume.
3. Explain adiabatic steady flow ellipse.
4. Define and write the significance of impulse function.
5. Show that M = 1 at the point of maximum entropy for Rayleigh flow.
6. Prove that impulse function is constant for Rayleigh flow.
7. Explain choking for Fanno flow.
8. Write a note on thickness shock wave.
9. Why does normal shock occur only for supersonic flow of a perfect gas ?
10. Write the principle of hot wire anemometer. **(4×10=40 Marks)**



PART – B

**Module – I**

11. Starting from fundamentals derive the mass momentum and energy equations for an infinitesimal control volume. What are the assumptions made ?

OR

12. a) Derive an equation for flow compressibility factor in terms of K and M.

    b) A supersonic fighter plane flies at an altitude of 3000 m. An observer on the ground hears the sonic boom 7.5 s after passing of the plane over his head. Estimate the speed of the plane and Mach number. Take average temperature to be 290 K.

## Module – II

13. a) Show that Mach number is unity at the point of maximum entropy on the Fanno line.

    b) Air flows through a circular duct at the rate of 8 kg/s. The inlet and exit Mach numbers are 0.15 and 0.5 respectively. The inlet pressure and temperature are 375 KPa and 318 K respectively. The coefficient of friction is 0.006. Find (a) the exit pressure, temperature and velocity (b) the diameter and length of the duct (c) change in entropy.

OR

14. Derive the following relation for Rayleigh flow :

$$\frac{Q_{max}}{C_P T} = \frac{(M^2-1)^2}{2(k+1)M^2}$$

Start the equations from fundamentals.

## Module – III

15. Derive the following relations for a normal shock :

a) $$My^2 = \frac{M_x^{\,2} + \frac{2}{k-1}}{\frac{2k}{k-1} M_x^{\,2} - 1}$$

b) $$\frac{P_{0y}}{P_x} = \left(\frac{k+1}{2} M_x^2\right)^{\frac{k}{k-1}} \left[\frac{2k}{k+1} M_x^2 - \frac{k-1}{k+1}\right]^{\frac{1}{1-k}}.$$

OR

16. a) Explain the method of velocity measurement using a constant current hot wire anemometer.

    b) Describe the working principle of Schileren apparatus.