(Pages : 3) **1844**

Reg. No. : ....

Name : ....

Seventh Semester B.Tech. Degree Examination, May 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 permitted.*

PART – A

1. Define Crocco number. Explain its significance.

2. Write the significance of pressure coefficient.

3. Prove that A^*P_o = a constant for adiabatic flow.

4. Show that $h + \frac{V^2}{z}$ = a constant for Fanno flow.

5. Explain choking in Fanno flow.

6. Prove that Mach number is unity at the point of maximum entropy for Rayleigh flow.

7. Draw the h-s and p-v diagram for Rayleigh flow. Explain.

8. Explain shock strength.

9. Write a note on supersonic flow over a compression and an expansion corner.

10. Explain temperature recovery factor. **(4×10=40 Marks)**

P.T.O.

PART – B

Module – I

11. a) Derive the equation for adiabatic steady flow ellipse.

b) Define stagnation temperature and stagnation pressure. Argon is stored in a reservoir at 320 K. Determine stagnation enthalpy and velocity of sound if K = 1.658 and molecular weight of argon is 39.95.

OR

12. a) Derive the relation between the Mach number M and dimensionless Mach number M*.

b) A is at 313 K flows from a large tank through a converging nozzle of 40 mm diameter. The tank contains air at 155 kPa and the discharge is to a pressure of 96 kPa. Calculate the mass flow rate through the nozzle.

Module – II

13. a) Show that Mach number at the point of maximum enthalpy on the Rayleigh line is $\frac{1}{\sqrt{K}}$.

b) Air at P_1 = 300 kPa, T_1 = 288 K and M_1 = 1.5 is brought to sonic velocity in a frictionless constant area duct through which heat transfer can occur. Determine the final temperature and pressure, change in entropy and heat added during the process.

OR

14. Starting from fundamentals, show that for Fanno flow, the friction parameter is given by $\frac{4fL_{max}}{D} = \frac{1-M^2}{kM^2} + \frac{k+1}{2k} \ln\left[\frac{(k+1)M^2}{2\left(1+\frac{k-1}{2}M^2\right)}\right]$.

Module – III

15. a) Derive Rankine-Hugonit relation.

    b) Air enters a 30 cm diameter duct at a Mach number of 2.5, temperature of 400 K and a pressure of 100 kPa. A normal shock occurs at a Mach number of 1.7 and the exit Mach number is 0.8. The coefficient of friction is 0.004. Calculate the length of duct upstream and downstream of normal shock. Assume adiabatic flow.

OR

16. Explain with neat sketches the working of :

    a) Supersonic Pitot tube

    b) Interferometer. **(3×20=60 Marks)**