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Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, April 2015
(2008 Scheme)
08.703. GAS DYNAMICS (M)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***all*** *questions from Part* ***A.***
2) Answer ***one*** *full question from* ***each*** *Module of Part* ***B.***

PART – A

1. Differentiate between system and control volume approaches.
2. Define flow compressibility factor and write its significance.
3. Explain the concept of stagnation state for a flowing fluid.
4. Write the difference between normal and oblique shocks.
5. Derive the steady flow energy equation.
6. Explain choking in Rayleigh flow.
7. What is isothermal flow ? Give two examples.
8. State Karman's rule for supersonic flow.
9. Show that the change in entropy across a normal shock wave is

$$S_y - S_x = R \, lu\left(\frac{Pox}{Poy}\right).$$

10. Write a note on Schileren technique of flow visualisation. **(10×4 = 40 Marks)**

PART – B

Module – I

11. a) Explain mach cone, zone of action and zone of silence.
    b) Starting from fundamentals derive the expression for sonic velocity through a fluid as $\sqrt{KRT}$

OR

12. a) Air flows through a duct at a pressure of 1.4 bar with a velocity of 200 m/s. Determine the isentropic stagnation pressure and stagnation temperature if the static temperature is 301 K.
    b) Derive the equation for maximum mass flow rate through a nozzle

Module – II

13. a) Dry air is travelling with a speed corresponding to M = 2.5 and friction factor is 0.003. What is the maximum possible length of the duct if its diameter is 5 cm ?

b) Show that $\frac{S-S^*}{C_P} = l\,a\,M^2\left[\frac{1+K}{1+KM^2}\right]^{\frac{K+1}{K}}$ for Rayleigh flow.

OR

14. Derive the following relations for Fanno flow

a) $\frac{F}{F^*} = \frac{1+KM^2}{M\sqrt{2(K+1)\left(1+\frac{k-1}{2}M^2\right)}}$

b) $\frac{\rho}{\rho^*} = \frac{1}{M^*} = \frac{1}{M}\sqrt{\frac{2\left(1+\frac{K-1}{2}M^2\right)}{K+1}}$

Module – III

15. a) Derive the relation $\frac{P_y}{P_x} = \frac{2K}{K+1}Mx^2 - \frac{K-1}{K+1}$ for a normal shock.

b) A gas stream ahead of a normal shock has pressure, temperature and velocity of 0.3 bar, 300 K and 800 ms respectively. Determine the mach number, pressure, temperature downstream of the shock and entropy change across the shock.

OR

16. Explain the working of

a) Shadow graph

b) hot wire anemometer. **(3×20= 60 Marks)**