CBCS SCHEME

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15AE552

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Gas Dynamics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain the terms :
- i) Stagnation Enthalpy
- ii) Stagnation Temperature
- iii) Stagnation velocity of sound
- iv) Stagnation pressure
- v) Stagnation density **(10 Marks)**

b. State and explain thrust function. **(03 Marks)**

c. Differentiate between flow and non-flow process of work. **(03 Marks)**

OR

2 a. Derive Bernoulli's equation for Isentropic compressible flow. **(08 Marks)**

b. Derive an expression for one – dimensional steady flow continuity equation. **(08 Marks)**

Module-2

3 a. Write a short note on Acoustic velocity and different regime of speed. **(06 Marks)**

b. Explain Mach number and the Mach cone and angle. **(06 Marks)**

c. Explain the Rayleigh curve with the help of a neat sketch. **(04 Marks)**

OR

4 a. Derive an governing equations for Fanno and Rayleigh lines. **(08 Marks)**

b. Explain Fanno curve with the neat sketch and derive Fanno flow equations. **(08 Marks)**

Module-3

5 a. Write a short note on the classification of wave phenomena. **(06 Marks)**

b. Derive an expression for Hugoniot equation. **(10 Marks)**

OR

6 a. Briefly explain the following with neat graph
- i) Weak waves
- ii) Compression waves
- iii) Normal Shock waves
- iv) Obligue Shock waves. **(12 Marks)**

b. Write an expression for Rayleigh pilot equations and explain. **(04 Marks)**

Module-4

7 a. Derive the following relations for one – dimensional isentropic flow

i) $\frac{dA}{A} = \frac{dP}{\rho c^2}(1-M^2)$

ii) $\frac{P^*}{P} = \left[\frac{2}{\gamma+1} + \frac{\gamma-1}{\gamma+1}M^2\right]^{\frac{\gamma}{\gamma-1}}$ **(08 Marks)**

b. Explain the effect of pressure ratio on Nozzle operation. **(08 Marks)**

OR

8 a. Describe the behavior of flow in a convergent divergent nozzle. (04 Marks)
b. Explain the effect of back pressure on nozzle flow. (04 Marks)
c. Derive an expression for Area ratio as function of Mach number. (08 Marks)

Module-5

9 a. Explain application of dimensional analysis. (08 Marks)
b. Write a short note on Flame propagation. (08 Marks)

OR

10 Briefly explain the following :
a. Premixed flames (04 Marks)
b. Diffusion flames (04 Marks)
c. Theories of flame propagation (04 Marks)
d. Flames stabilization (04 Marks)

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