Ministry of Higher Education &
Scientific Research
Tikrit University
College of Engineering
Deptartment of Mechanical Engineering

FINAL EXAMINATION

2015-2016

Sample (B)

Class : 3^{rd} Stage
Subject : Gas Dynamics & Turbomachinery
Time : Three Hours
Date: : Sunday 29^{th} May, 2016

EXAMINATION REQUIREMENTS:

1. **Tables for Gas with (γ = 1.4).**
2. **Oblique Shock Wave Chart.**
3. **Turbine Charts.**

Note: Answer FIVE questions only BUT answer the QUESTION (1) is COMPULSORY.

QUESTION 1(A) [6 Marks]

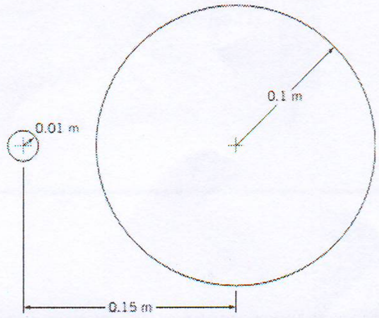
Consider a normal shock wave in a perfect gas. Starting from first principle, the local Mach number by the relation:

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

where
M^* throat Mach number
γ is specific heat ratio

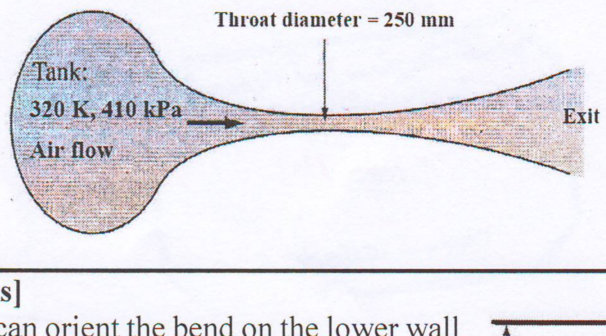
QUESTION 1(B) [4 Marks]

At a given instant of time, two pressure waves, each moving at the speed of sound, emitted by a point source moving with constant velocity in a fluid at rest are shown in Figure. Determine the Mach number involved and indicate with a sketch the instantaneous location of the point source.



QUESTION 2 [10 Marks]

For steady isentropic flow, possible mass flow rate through Figure.



QUESTION 3 [10 Marks]

With careful design, one can orient the bend on the lower wall so that the reflected wave is exactly canceled by the return bend, as shown. This is a method of reducing the Mach number in a channel (a supersonic diffuser). If the bend angle is = 10 deg., find (a) the downstream width (h) and (b) the downstream Mach number. Assume a weak shock wave.