Internal assessment 1

Q8. R is const. $C_p(T) - C_v(T) = R$

Q11. 1/2

Issues

1. One student has submitted the assessment for Naman.
2. Ample scope for sharing the answers. So may be we should restrict it to 15 min only.

Quiz:

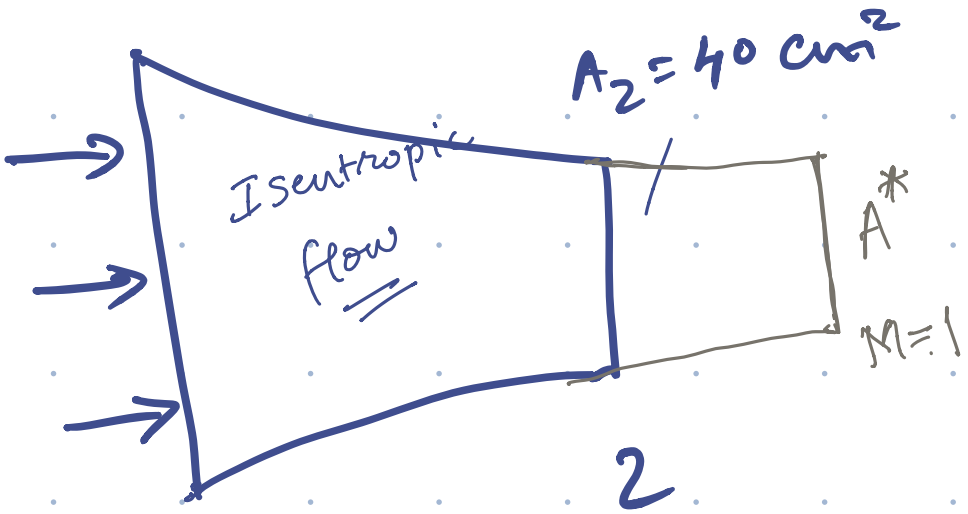
1. Syllabus :- Everything covered upto Friday.
2. MCQ

Paper { Short answer
Long answer.

Tutorial :— Will send by tomorrow evening.

Converging duct

$A_1 = 50\ cm^2$



A/A^* for M_1

$T_1 = 300K$

$P_1 = 100\ kPa$

$u_1 = 100\ m/s$

$\rho_1 = P_1/RT_1$

$M_2 = ?$

$P_2 = ?$

$T_2 = ?$

M	A/A^*
0.1	
0.2	
0.3	

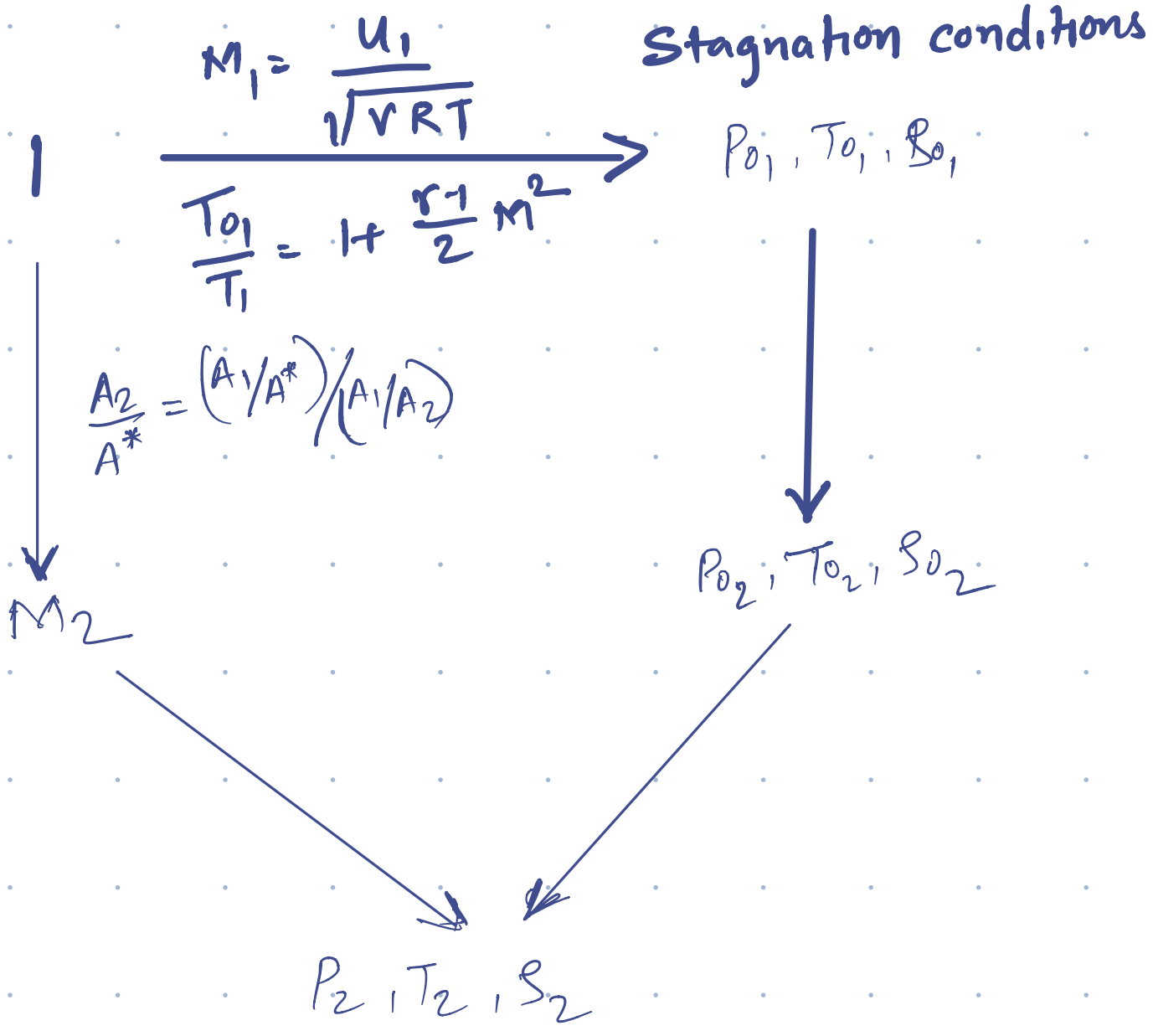
We know $\dot{m}_1 = \dot{m}_2$.

Also, $\dot{m} = \dfrac{P_0}{\sqrt{RT_0}} A\, F(\gamma, M)$

$\therefore \dfrac{A_1}{A_2} = \dfrac{F(\gamma, M_2)}{F(\gamma, M_1)}$

$\dfrac{A_1}{A^*} = \dfrac{F(\gamma,1)}{F(\gamma, M_1)}$

$\dfrac{A_2}{A^*} = \dfrac{F(\gamma,1)}{F(\gamma, M_2)}$

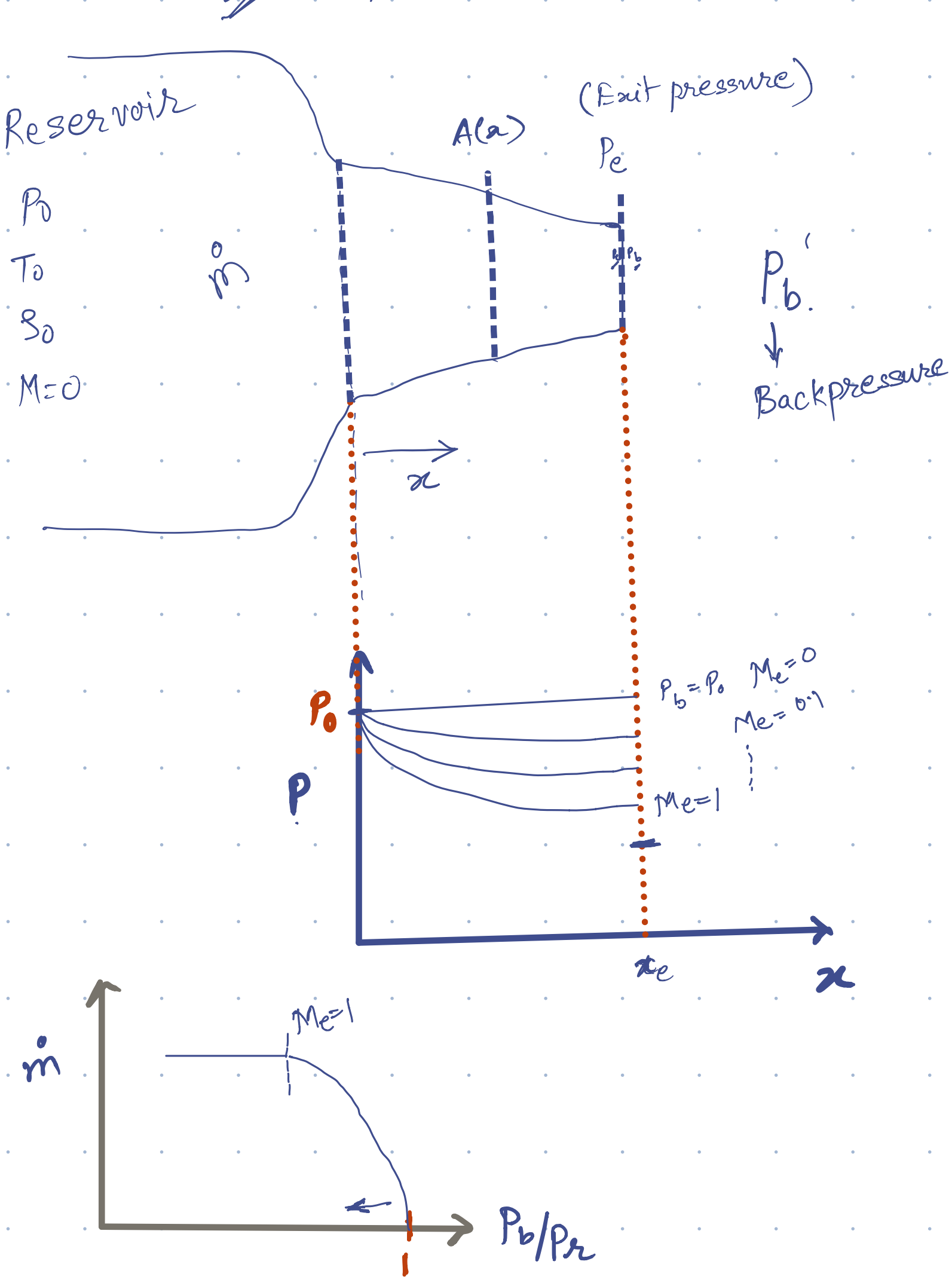


A^* = Area at which $M=1$ assuming isentropic expansion.

$M_1 = \sqrt{\gamma R T_1} = 0.288$ $\qquad \frac{A_1}{A^*} = 2.098$

$\frac{A_1}{A_2} = \frac{A_1/A^*}{A_2/A^*} \Rightarrow \frac{A_2}{A^*} = (A_1/A^*)/(A_1/A_2)$

$M_2 \approx 0.37 \Leftarrow \frac{A_2}{A^*} = \frac{2.098}{5/4} = 1.689$


Reservoir
P_0
T_0
S_0
$M=0$
$\dot{m}$
A(a)
P_e
(Exit pressure)
P_b
P_b'
Backpressure
x
P_0
P
$P_b = P_0$
$M_e = 0$
$M_e = 0.1$
$M_e = 1$
x_e
x
$\dot{m}$
$M_e = 1$
P_b/P_r

→ Converging duct cannot produce supersonic flow.

→ **Choked flow** & maximum mass flow rate

→ P_b/P_r ratio for which $M_e = 1$ is called critical pressure ratio.