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# PROBLEM 6-9N QUESTION

## Proofs Involving The Brayton Cycle

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A. The Brayton Cycle identified in Figure 1 utilizes intercooling. The replacement of the compressor process (a-b) with a two step compression process (a-c and d-e), an intermediate cooling phase (c-d) which defines the intercooling process subject to the constraint  $T_d \geq T_a$  and a heating phase (e-b) to return to state b presumably creates a benefit. This benefit could be either:

- (1) reduction in work required for the compression process, or
- (2) reduction in the irreversibility of the required compression process.

Provide proofs which demonstrate whether benefits (1) and (2) are true or false. You may treat the cooling phase c-d and the heating phase e-b as irreversible.

B. You must select the intermediate pressure,  $P_c$  ( $P_c = P_{cs} = P_d$ ) at which to perform the intercooling phase.

- (1) Which pressure should be selected in order to maximize the reduction in work for the compression process? Prove your answer.
- (2) Which pressure should be selected in order to minimize the irreversibility of the compression process? Prove your answer.

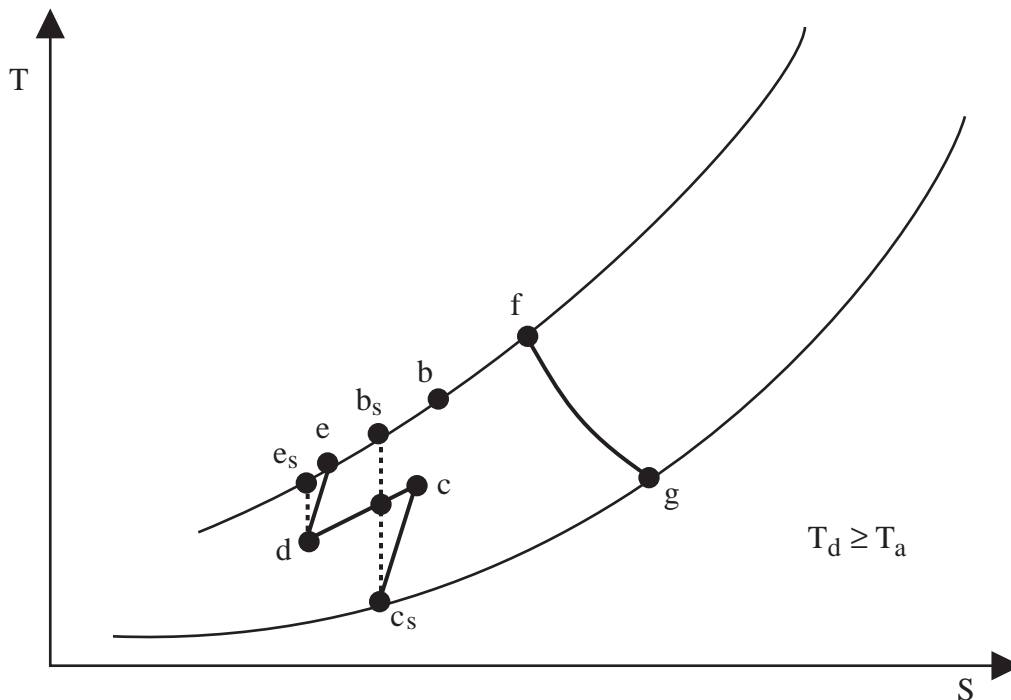


Figure 1