ME 433 Week #3 STUDY GUIDE

Engine Parameters

1) What is the relation between clearance volume, displacement volume, and compression ratio?
2) What crank angle corresponds to top dead center?
3) What crank angle corresponds to bottom dead center before compression?
4) What crank angle corresponds to bottom dead center after expansion?
5) What is the fundamental equation for mean piston speed?
6) Why is mean piston speed a useful quantity in comparing different engines?
7) How are torque and power measured in an engine testing lab?
8) What is the relationship between indicated work and indicated power?
9) What is the meaning of \( n_r \)? What values does this assume? Why?
10) What is meant by friction power and how is this determined?
11) What is the shape of a characteristic torque curve for an engine? Where is it maximum? Why?
12) What is the shape of a characteristic power curve for an engine? Where is it maximum? Why?
13) Why is imep a useful concept and how is it calculated?
14) What is bmep and how is it determined?
15) Where does maximum bmep occur? Why?
16) Why is brake specific fuel consumption a useful concept and how is it calculated?
17) What does a typical bsfc map look like for a naturally aspirated engine? Why do contours increase as you (a) move left, (b) move up, (c) move down, and (d) move right on a bsfc map?
18) What is the relationship between combustion efficiency and thermal efficiency?
19) What is meant by arbitrary efficiency of an engine?
20) How is volumetric efficiency determined and what variables are involved?
21) What is the air-fuel (AF) ratio of an engine?
22) How does the air-fuel ratio compare between SI and CI engines?

Derivation of Long Equations

23) In the long form of the engine power equation, what are the thermochemistry terms? The fluid mechanics terms? The kinematics terms?
24) What is the long form of the engine torque equation?
25) What is the long form of the brake specific fuel consumption equation?

Relationship Between Parameters & Performance Modeling Example

26) Validate all governing equations as well as the quantities and units in each of these expressions.

Typical Values for Parameters

27) What parameters are included in this resource? Why?
28) What determines whether a high value or a low value of an engine parameter applies to the different engine types?
29) Why is there a difference in bmep between naturally aspirated and turbocharged engines?
30) The Diesel cycle has lower thermal efficiency than the Otto cycle at the same compression ratio, why is the brake specific fuel consumption of CI engines lower than SI engines?