

## ME 433 Week #3 STUDY GUIDE

### Engine Parameters

- 1) What is the relation between clearance volume, displacement volume, and compression ratio?
- 2) What crankangle corresponds to top dead center?
- 3) What crankangle corresponds to bottom dead center before compression?
- 4) What crankangle 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?