Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH /AUE(O)/SEM-5/AUE-502/2012-13

2012

AUTOMOTIVE DIESEL ENGINE

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) The ..... class of hydrocarbon fossil fuels is best suited for use as a fuel in diesel engines.
   - a) olefinic
   - b) parafinic
   - c) napthene
   - d) aromatic.

   ii) Cetane
   - a) has zero cetane number
   - b) has 85 cetane number
   - c) has 100 cetane number
   - d) has 15 cetane number.

   iii) For the same temperature limits and heat input the most efficient cycle is
   - a) Carnot cycle
   - b) Diesel cycle
   - c) Otto cycle
   - d) Dual cycle.

   iv) The ignition temperature of diesel fuel is about
   - a) 400°C
   - b) 300°C
   - c) 600°C
   - d) 800°C.

v) For diesel engines, the method of governing employed
   a) Quality governing
   b) Quantity governing
   c) Hit and miss governing
   d) both (a) and (b).

vi) If the temperature of supply air to an IC engine increase, its efficiency
   a) increase
   b) decrease
   c) does not change
   d) may increase or decrease depending on other factors.

vii) A diesel engine is usually more efficient than a spark ignition engine because
   a) diesel being a heavier hydrocarbon, releases more heat per kg than gasoline
   b) the air standard efficiency of diesel cycle is higher than the Otto cycle, at a fixed compression ratio
   c) the compression ratio of a diesel engine is higher than that of an SI engine
   d) self ignition temperature of diesel is higher than that of gasoline.

viii) The delay period in diesel engine depends upon which of the following ?
   a) Temperature and pressure in the cylinder at the time of injection
   b) Nature of the fuel mixture strength
   c) Relative velocity between the fuel injection and air turbulence pressure of residual gases
   d) All of these.

ix) The knocking tendency in compression ignition engines increases with

a) increase of coolant water temperature

b) increase of temperature of inlet air

c) decrease of compression ratio

d) increase of compression ratio.

x) In the operation of four-stroke diesel engines, the term 'squish' refers to the

a) injection of fuel in the pre-combustion chamber

b) discharge of gases from pre-combustion chamber

c) entry of air into the combustion chamber

d) stripping of fuel from the core.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. Compare the thermal efficiency between Otto, Diesel and Dual cycle with proper *P-V* and *T-S* diagram when compression ratio and heat input is same for all the cycle.
3. What are the differences in abnormal combustion between SI and CI engines ?
4. Explain the stages of combustion in a CI engine with $p - \theta$ diagram and show different important points in the diagram.
5. Discuss the important properties of a CI engine fuels.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

6. a) Discuss various types of super charger.

   b) What are the limitations of a turbocharger ?

   c) Explain with a neat sketch the principle of exhaust turbocharging of a single-cylinder engine. 5 + 3 + 7

7. a) Explain the phenomenon of diesel knock. Discuss the methods of controlling diesel knock. Compare the knocking between CI and SI engines with various variables.

   b) What are the main three air motion principles taken into consideration in the design of a diesel engine ? Define swirl ratio. 10 + 5

8. a) Explain with neat sketches, the typical forms of direct and indirect combustion chambers employed in CI engines highlighting the design objectives, their advantages and disadvantages respectively.

   b) What are the advantages of supercharging ? 10 + 5

9. a) What is ignition delay ? Explain briefly about the different features affecting the delay period.

   b) Draw a line diagram of a CI engine fuel supply system and showing all the components.

   c) What are the general functions of a governor used in CI engine ?

   d) Write the names of major components of a fuel injector.

   7 + 3 + 3 + 2

==========