

CS/B.TECH/AUE (NEW)/SEM-6/AUE-601/2013

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2013**

AUTOMOTIVE PETROL & 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 × 1 = 10

- i) Carburetor is used for
- a) mixing air and fuel b) energy storage
 - c) producing spark d) gear operation.
- ii) The fuel injection in a distributor type pump is controlled by
- a) changing plunger stroke
 - b) changing speed of rotor
 - c) rotating the cam ring
 - d) changing the number of cams on the ring.

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- iii) Connecting rod connects between
- a) Engine head and engine block
 - b) Piston and engine head
 - c) Piston and crankshaft
 - d) Crankshaft and gear box.
- iv) Knocking in SI engine is a phenomenon.
- a) Post-TDC
 - b) Pre-TDC
 - c) TDC
 - d) None of these.
- v) The stoichiometric air to fuel ratio in an SI engine is
- a) 16 : 1
 - b) 14.5 : 1
 - c) 12 : 1
 - d) 10 : 1.
- vi) For diesel engines, the method of governing employed is
- a) quantity governing
 - b) quality governing
 - c) hit and miss governing
 - d) both (a) and (b)

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- vii) Tetraethyl lead (TEL) increases
- Octane number
 - Cetane number
 - Cloud point
 - Pour point.
- viii) With increase in compression ratio, flame speed
- decreases
 - increases
 - remains the same
 - none of these.
- ix) Mechanical efficiency may be defined as
- Indicated Horse Power (IHP) to Brake Horse Power (BHP)
 - Brake Horse Power (BHP) to Indicated Horse Power (IHP)
 - Indicated Horse Power (IHP) - Brake Horse Power (BHP)
 - Indicated Horse Power (IHP) \times Brake Horse Power (BHP).

- x) Specific fuel consumption in MPFI engines is
- better than carbureted engine
 - equal to that of carbureted engine
 - cannot be compared
 - worse than carbureted engine.

GROUP - B

(Short Answer Type Questions)

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

- Discuss the effect of engine variables on flame propagation.
- Why is the actual cycle efficiency much lower than the air standard cycle efficiency ?
- Explain with a graph the three possible theoretical scavenging processes.
- Compare the Otto, Diesel and Dual cycles, for the same compression ratio and maximum pressure and temperature.
- What is ignition delay ? Explain briefly about the different features affecting the delay period.

GROUP - C**(Long Answer Type Questions)**

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

7. a) In an air standard diesel cycle, the compression ratio is 16, and at the beginning of isentropic compression, the temperature is 15°C and the pressure is 0.1 MPa. Heat is added until the temperature at the end of the constant pressure process is 1480°C . Calculate the cut-off ratio, the heat supplied per kg of air, the cycle efficiency and the M.E.P. 8
- b) Explain the stages of combustion in a CI engine with $P-\theta$ diagram and show different important points in the diagram. 7
8. a) A two stroke SI engine having a cylinder volume of 1100 c.c. and compression ratio 8 runs at 2800 rpm. The exhaust pressure is 1.07 bar and inlet temperature is 37°C and scavenging efficiency is 0.5. Calculate the trapping efficiency, delivery ratio, for a charge flow of 4 kg/min. If brake thermal efficiency is 0.25, fuel-air ratio is 0.068, calculate brake power and brake specific fuel consumption (BSFC). Also calculate short circuiting loss per hour. Take calorific value of fuel as 45 MJ/kg. 10

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- b) What are the main functions of an injection pump ? What are two types of injection pump that are commonly used ? Describe briefly. 5
9. a) Discuss with the help of neat sketches, the operation of a battery ignition system of a typical SI engine. Explain how the magneto-ignition system compares with the battery ignition system. 10
- b) What is meant by supercharging ? What is its effect on engine performance ? 5
10. With the help of neat schematic sketch derive the expression of A/F ratio as provided by a simple carburetor, taking into account the compressibility of air. Hence comment on the inherent limitations of such a carburetor in providing the requisite A/F ratio over the entire operating range of an SI engine.
11. a) An eight-cylinder, four-stroke engine of 9 cm bore and 8 cm stroke with a compression ratio of 7 is tested at 4500 r.p.m. on a dynamometer which has 54 cm arm. During a 10 minute test the dynamometer scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44000 kJ/kg. Air at 27°C and 1 bar was supplied to the carburetor at the

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rate of 6 kg/min. Find (i) the brake power delivered, (ii) the brake mean effective pressure, (iii) the brake specific fuel consumption, (iv) the brake specific air consumption, (v) the brake thermal efficiency, (vi) the volumetric efficiency and (vii) the air-fuel ratio. 12

- b) Develop valve timing diagram of four stroke SI and CI engines. 3

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