

CS/B.TECH/AUE/EVEN/SEM-6/AUE-601/2015-16



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

Paper Code : AUE-601

**AUTOMOTIVE PETROL AND 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) The cam shaft of a four stroke I.C. engine running at 1500 rpm will run at
- a) 1500 rpm      ☒ b) 750 rpm
- c) 3000 rpm      d) None of these.
- ii) With increase in compression ratio, flame speed
- a) decreases      ☒ b) increases
- c) remains the same      d) none of these.

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iii) In CI engines the delay period is affected by

- ☒ a) Compression ratio
- b) Engine speed
- c) Output
- d) All of these.

iv) Methanol by itself is not a good CI engine fuel because

- a) Its Octane no. is high
- b) It Octane no. is low
- c) Both (a) and (b)
- ☒ d) None of these.

v) Octane no. of natural gas is

- ☒ a) 60-80
- b) 80-10
- c) > 100
- d) < 60.

vi) Gasohol is a mixture of

- ☒ a) 90% Ethanol + 10% Gasoline
- ☒ b) 10% Ethanol + 90% Gasoline
- c) 40% Ethanol + 60% Gasoline
- d) 50% Ethanol + 50% Gasoline.

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vii) The most perfect method of scavenging is

- a) Gross scavenging
- b) Uniflow scavenging
- ☒ c) Loop scavenging
- d) Reverse flow scavenging.

viii) The mean effective pressure obtained from engine indicator indicates the

- a) Maximum pressure developed
- b) Minimum pressure
- c) Instantaneous pressure at any instant
- ☒ d) Average pressure.

ix) In a four stroke cycle diesel engine, the exhaust valve

- ☒ a) Opens at 30° before bottom dead centre and closes at 10° after top dead centre
- b) Opens at 30° after bottom dead centre and closes at 10° before top dead centre
- c) Opens at bottom dead centre and closes at top dead centre
- d) May open and close anywhere.

x) The knocking in spark ignition engines can be reduced by

- ☒ a) Retarding the spark
- ☒ b) Increasing the engine speed
- c) Both (a) and (b)
- d) None of these.

### GROUP - B

#### ( Short Answer Type Questions )

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

- ☒ 2) Discuss the important properties of a CI engine fuels.
- ☒ 3) List the major losses and differences in actual cycle and air-standard cycle.
- ☒ 4) Compare four-stroke engine and two-stroke cycle engine.
- ☒ 5) In an Otto cycle air at 17°C and 1 bar is compressed adiabatically until the pressure is 15 bar. Heat is added at constant volume until the pressure rises to 40 bar. Calculate the compression ratio and air-standard efficiency.

6. Define the following :

- a) Scavenging Efficiency
- b) Charging Efficiency.

### GROUP - C

#### ( Long Answer Type Questions )

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

7. a) The following observations were recorded during a trial of a four stroke, single cylinder oil engine. Duration of trial is 30 min; oil consumption is 4 litres; calorific value of the oil is 43 MJ/kg; specific gravity of the fuel = 0.8; average area of the indicator diagram =  $8.5 \text{ cm}^2$ ; length of the indicator diagram = 8.5 cm; spring constant = 5.5 bar/cm; brake load = 150 kg; spring balance reading = 20 kg; effective brake wheel diameter = 1.5 m; speed = 200 rpm; cylinder diameter = 30 cm; stroke = 45 cm; jacket cooling water = 10 kg/min; temperature rise is  $36^\circ\text{C}$ .

Calculate the following :

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- (i) indicated power
- (ii) brake power
- (iii) mechanical efficiency
- (iv) brake specific fuel consumption in kg/kW-h
- (v) indicated thermal efficiency.

b) Explain briefly the following:

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- (i) Ignition delay
- (ii) Trapping efficiency
- (iii) Delivery ratio.

8. With the help of the 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 air fuel ratio over the entire operating range of an SI engine.  $9 + 6$

9. a) Describe with a neat P-θ plot, the stages of normal combustion in a typical SI engine. Indicate clearly the region susceptible to knocking on the sketch so drawn. Explain in brief the factors influencing detonation in SI engine. 8
- b) Discuss the effect of engine variables on flame propagation. 7

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10. Write short notes on any *three* of the following : 3 × 5

- ✓ a) Supercharger and Turbocharger
- ✓ b) Crankcase scavenge engine
- ✓ c) Valve timing diagram for 4-stroke IC engine
- d) Important qualities of SI engine fuel
- e) Morse Test.

✓ 11. a) In an Otto cycle air at 15°C and 1.05 bars is compressed adiabatically until the pressure is 13 bar. Heat is added at constant volume until the pressure rises to 35 bar. Calculate the air standard efficiency, the compression ratio and the mean effective pressure for the cycle. Take  $C_v = 0.718$ .

$R = 0.287$ . 5

✓ b) Develop valve timing diagram of four strokes SI and CI Engine. 5

✓ c) Explain with a graph the three possible theoretical scavenging processes. 5