

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Mechanical Engineering



051

Study Programme	Bachelor of Technology Honours in Engineering
Name of the Examination	Final Examination
Course Code and Title	DMX4208 Automobile Technology
Academic Year	2021/2022
Date	21 st February 2023 (Tuesday)
Time	1330 – 1630 hrs
Duration	03 hours

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Seven (7)** questions in **Three (3)** pages.
3. Answer any Six (6) Questions. All questions carry equal marks.
4. This is a Closed Book Test (CBT).
5. Answers should be in clear handwriting.

(1) (a) Explain why the valve timing is important in 4-stroke engines.

(b) Fig. 01 shows a typical valve timing diagram, explain the sequence of valve opening and closing. Find the valve overlap of this engine.

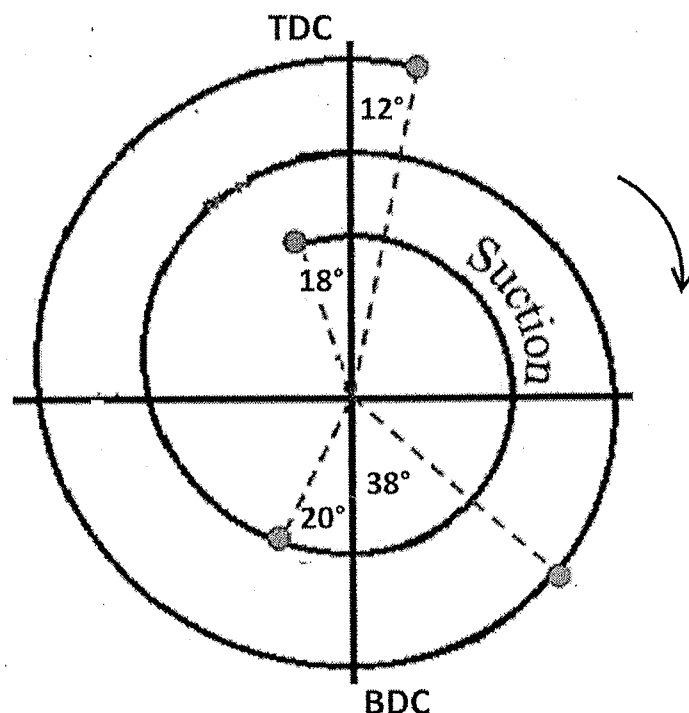


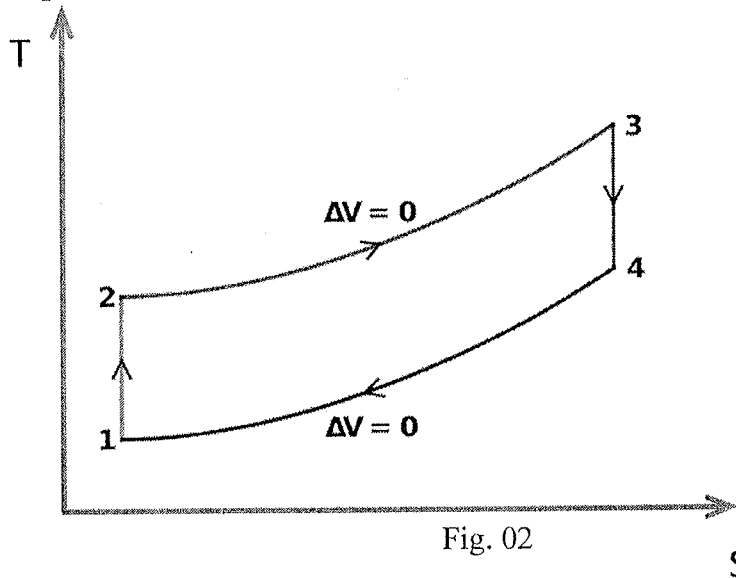
Fig. 01

(c) Briefly explain the Exhaust Gas Recirculation (EGR) System in modern vehicles and describe one type of EGR with the aid of sketches.

- (2) (a) Fig. 02 shows T – S (Temperature – Entropy) diagram of an air standard Otto cycle. If γ is the ratio between the fundamental heat capacities and $r = V_1/V_2$ show that the thermal efficiency of the air standard Otto cycle is

$$\eta = 1 - \frac{1}{r^{(\gamma-1)}}$$

Where V_1 is the (Swept Volume + Clearance Volume) and V_2 is the Clearance Volume.



- (b) With the aid of sketches describe the transistor ignition system used in spark ignition engines.
- (3) (a) Explain why it is necessary to have multicylinder engines when the power rating of an engine goes up.
- (b) Fig. 03 shows the piston arrangement of a four stroke six cylinder in-line engine. If cylinder 1 fires at crank angle 0° write the possible firing orders..

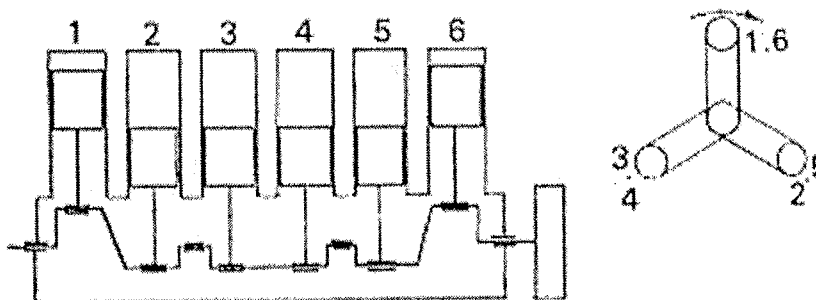


Fig. 03

(c) Find the theoretical air to fuel ratio of octane. (C_8H_{18}) Oxygen content in atmospheric air is 23 % w/w.

- (4) (a) A four cylinder four stroke spark ignition engine has an output of 35 KW at a speed of 1500 rev/min. A Morse test was carried out and the brake torque readings were obtained. They were 149, 143, 140 and 147 Nm for the first, second, third and fourth cylinders of the engine respectively. Calculate the Indicated power and the Mechanical efficiency of this engine.
- (b) Briefly discuss about the leaf spring suspension systems used in vehicles. (You may use sketches to elaborate your answer)
- (5) (a) Describe the Full Pressure Lubrication System used in vehicle engines.
- (b) An internal combustion engine which develops 32 kW brake power has a pressurized forced water circulation system for cooling. This engine converts 22 % of the heat energy available in fuel into useful work and the energy lost to cooling water accounts for 33 % of the heat energy of the fuel. If the maximum and minimum temperatures of cooling water are 88 °C and 80 °C, respectively calculate the flowrate of cooling water in the engine. (Specific heat capacity of water is 4200 J/Kg°C)
- (c) Describe the operating principle of Anti-Lock Brake System (ABS) with the aid of sketches..
- (6) (a) A four cylinder four stroke IC Engine rotating at 1800 rpm has a cylinder bore diameter of 125 mm and crank radius of 80 mm. From the indicator diagram MEP (Mean Effective Pressure) is found as 120 kPa. If mechanical efficiency is 80% find the Brake Power.
- (b) With the aid of sketches briefly describe the functioning and construction of compression ring and the oil control ring used in motor vehicle engine pistons.
- (7) (a) A motor car has a wheel base of 2.75 m and the distance between pivot centers is 1.05 m. The wheel track at the front and the rear is 1.22 m. If the maximum angle through which the inner front wheel can be turned is 40° calculate the maximum angle through which outer front wheel is turned and the turning radius of the outer front wheel. (Fig. 07 shows a schematic representation of four-wheel vehicle while it is turning)

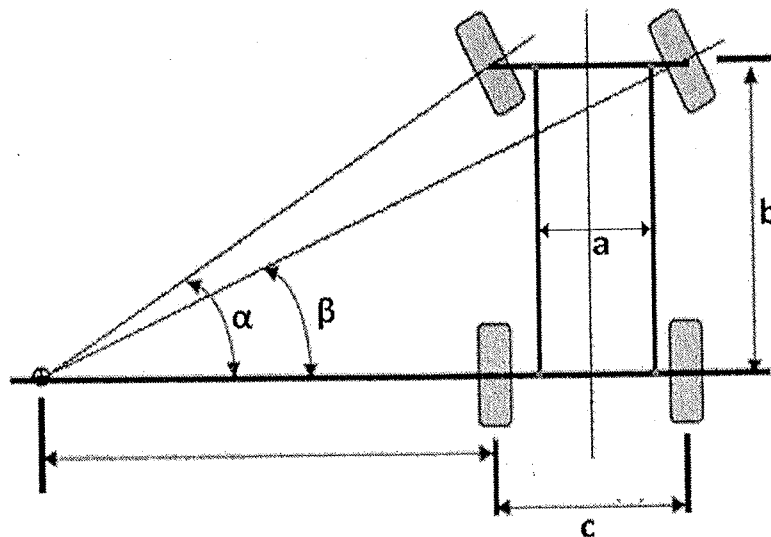
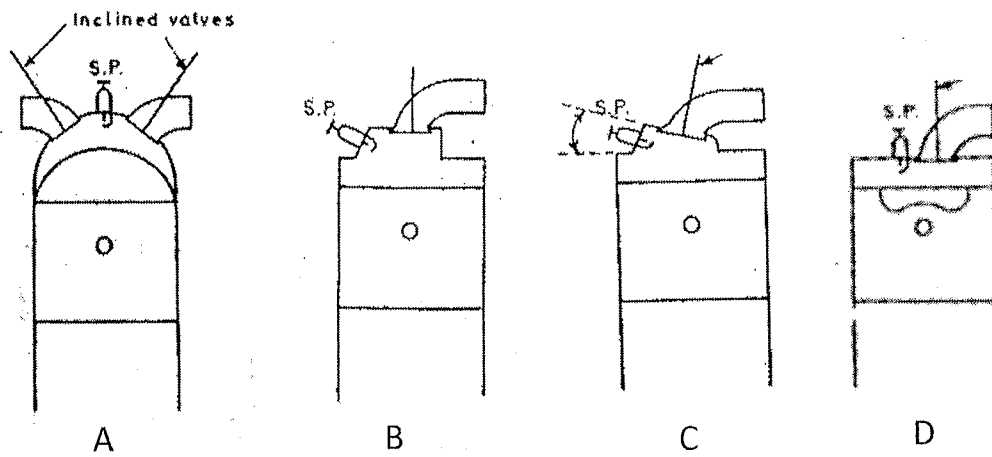


Fig. 07

(b) Identify the given types of combustion chambers employed in spark ignition engines and describe one of them.



ALL RIGHT RESERVED