

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



Study Programme : Bachelor of Science Honours in Engineering
Name of the Examination : Final Examination
Course Code and Title : DMX4208 Automobile Technology
Academic Year : 2024/25
Date : 5th March 2026
Time : 0930-1230h
Duration : 3 hours

INDEX NO:

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General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of Five (5) questions in Four (4) pages.
3. Answer all questions.
4. All questions carry equal marks.
5. Answer for each question should commence from a new page.
6. This is a Closed Book Test (CBT).

Question 01

A four-cylinder, four-stroke petrol engine with a bore of 85 mm and stroke of 90 mm was tested on a dynamometer and the following data were recorded.

Test Data:

- Net load on brake (torque arm) = 350 N
- Length of torque arm = 500 mm
- Engine speed = 2400 rev/min
- Fuel consumption = 0.22 kg/min
- Lower calorific value of fuel = 43,000 kJ/kg
- Mechanical efficiency = 85%
- Cooling water flow rate = 0.88 kg/s and water temperature rise = 12°C
- Inlet air flow rate = 0.042 kg/s
- Ambient air temperature = 25°C
- Exhaust gas temperature = 320°C
- Specific heat of exhaust gases (C_{pa}) = 1.15 kJ/kg·K
- Specific heat of water (C_{pw}) = 4.18 kJ/kg·K

Determine the following

- I. Brake thermal efficiency

3 marks

- | | |
|---|---------|
| II. Indicated thermal efficiency | 3 marks |
| III. Indicated mean effective pressure | 4 marks |
| IV. Brake specific fuel consumption | 3 marks |
| V. Heat rejected to cooling water as a percentage of heat supplied | 4 marks |
| VI. Heat carried away by exhaust gases as a percentage of heat supplied | 3 marks |

Question 2

Figure Q2 represents an electrical circuit of a conventional contact breaker point (CB) ignition system

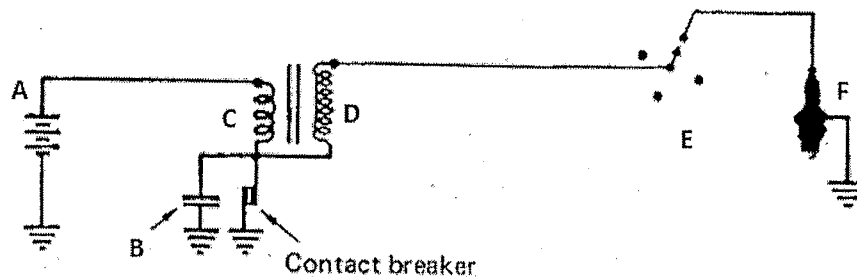


Figure Q2: Electrical Circuit of Conventional Ignition System

- I. Name the parts from A to F of the above diagram 5 marks
- II. Explain the electromagnetic process for the following instances in relation to the conventional ignition system
 - (a) when the CB points close, including the role of the primary winding. 4 marks
 - (b) when the CB points open, and how high voltage is generated in the secondary winding. 4 marks
- III. Describe the term "Dwell Angle" in ignition system 3 marks
- IV. Describe two advantages of transistorized ignition system, over conventional ignition system 4 marks

Question 03

I. The figure Q3 illustrates a schematic of an automotive cooling system

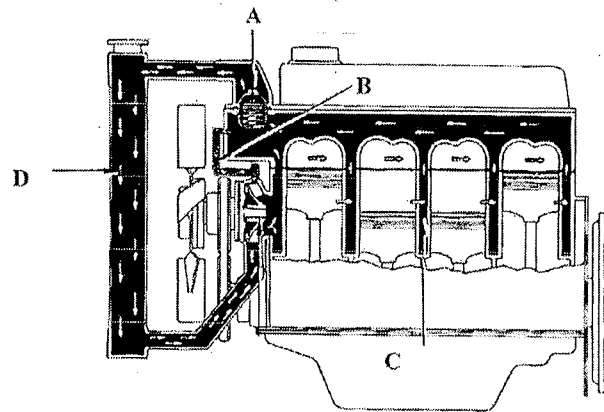


Figure Q3: Schematic of an Automotive Cooling System

- Name the components from A, B, C and D. 4 marks
- II. Explain the operation of the cooling system (with relation to coolant flow and the operation of the A, B, C and D components) under the following conditions
- (a) When the engine is cold (during warm-up period) 4 marks
- (b) When the engine has reached normal operating temperature 4 marks
- III. With the aid of a labeled sketch, explain how a radiator pressure cap maintains the correct pressure in the cooling system during both pressure build-up and pressure release conditions. 5 marks
- IV. Describe the most likely cause for each of the following symptoms: 3 marks
- Coolant level drops regularly but no external leaks are visible.
 - Engine overheats but the radiator remains cold.

Question 04

- I. Draw a labeled valve timing diagram for a four-stroke petrol engine, showing the opening and closing of intake and exhaust valves relative to piston position. 6 marks

- II. Describe the technical function of a crankshaft vibration damper (harmonic balancer). 4 marks
- III. Explain what piston slap is, its causes, and methods used to reduce it. 4 marks
- IV. List the three main engine bearing materials used in automobile engines and compare their hardness, heat resistance, and strength, and state the suitable types of vehicle applications. 6 marks

Question 05

- I. Figure Q5 illustrates a cross section of a tandem brake master cylinder used in a passenger car

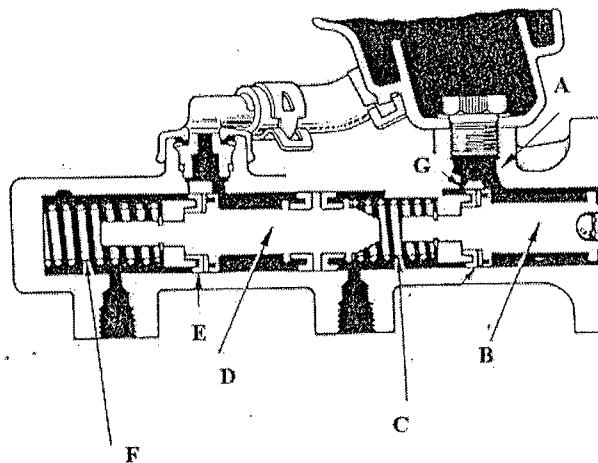


Figure Q5: A Cross Section of a Tandem Brake Master Cylinder

7 marks

Name the parts A, B, C, D, E, F and G

- II. With regard to Figure Q5, describe the operation of the tandem brake cylinder for the following instances.
 - During usual braking
 - When there is a fluid leakage in the one circuit (either front or rear)
 6 marks
- III. List and explain three important requirements that brake fluid must satisfy for proper brake system operation 3 marks
- IV. In an old sedan car (without ABS) brake pedal feels "spongy" and requires excessive pedal travel for the brakes to engage properly. During inspection, it was observed that brake fluid level in the reservoir is normal, however the fluid appears dark and contaminated. With reasons, describe the reason for the above issue. 4 marks

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