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	:	2023/2024
Date	:	19th March 2025
Time	:	1330-1630 hrs
Duration	:	3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of five (05) questions. All questions carry equal marks.
3. **Answer all five (05) questions.**

Question 01

A four-cylinder four stroke engine having a bore diameter 100 mm and a stroke 120 mm was tested using a Torque arm and the following observations were made.

Net load on the Torque arm – 300 N

Length of the Torque arm – 600 mm

Fuel consumption – 0.25 kg/min

Engine Cooling Water Flow Rate – 0.533 kg/s

Engine Cooling Water Temp Difference – 15 °C

Speed of the engine – 2000 rev/min

Lower calorific value of fuel – 42000 KJ/kg

Exhaust Temp– 300°C

Inlet Air Flow Rate– 0.08 kg/s

Ambient Temperature 26°C

If the Mechanical efficiency of the engine is 80%, calculate,

I. Brake thermal efficiency [3 marks]

II. Indicated thermal efficiency [3 marks]

III. Indicated mean effective pressure of the cylinder [4 marks]

IV. Specific fuel consumption [3 marks]

V. Heat rejected to cooling water as a percentage of input energy [3 marks]

VI. Heat rejected to the exhaust as percentage of input energy [4 marks]

Question 02

1) Explain **five** primary functions of lubricating oil in an internal combustion engine. [5 marks]
2) Explain **two** benefits of using multi-grade engine oil in modern internal combustion engines compared to single-grade engine oils. [5 marks]
3) Using a labeled diagram, explain the mechanism by which pressure is maintained in an engine oil pump. [5 marks]
4) Illustrate by block diagram of the flow of a forced lubrication system in an internal combustion for the engine components listed below. [5 marks]
    a) Piston and cylinder walls
    b) Big and small end bearings of a connecting rod

Question 03

1) 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. [5 marks]
2) Explain valve float (sometimes called valve toss) in high-RPM engines. [5 marks]
3) Explain what piston slap is, its causes, and methods used to reduce it. [5 marks]
4) Explain the functions of different types of piston rings in IC engine [5 marks]

Question 04

1) With a clear schematic diagram, explain the operation of a conventional ignition system. [6 marks]
2) Explain the advantages of a transistorized ignition system over a conventional ignition system. [4 marks]
3) How does a centrifugal advance mechanism modify optimize ignition timing as engine speed increases? [4 marks]

4) A 1990 sedan car with a conventional ignition system has the following problems:

- Engine is difficult to start.
- Engine runs roughly at idle.
- Car loses power when driving uphill.

Suspecting the problem is with the ignition system of the vehicle,

1. Name four components which you would check to find out the causes for above problems. [2 marks]
2. Briefly explain how you would perform checking of each of the components listed above [4 marks]

Question 05

a) Describe the functions of a carburettor used in a spark ignition engine [5 marks]

b) Figure 5.1 illustrates a simple carburettor.

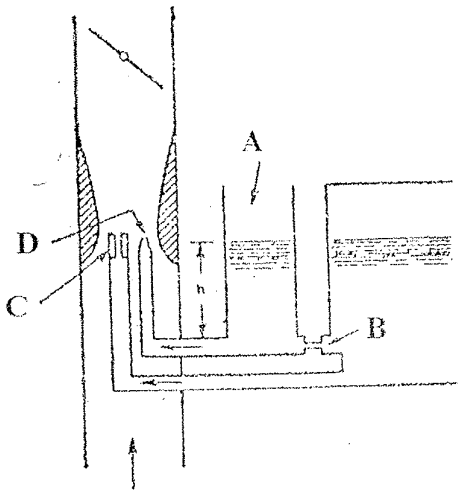

Figure 5.1: A Simple Carburettor

I. Name the components from A to D [4 marks]

II. Briefly explain how this dual fuel delivery system helps provide the appropriate fuel-air mixture at various engine speeds. [4 marks]

c) Describe **one** emission controlling devices used in automobiles. [3 marks]

d) With a neat sketch describe the how HC, CO, and NOx emission concentrations varies at air-fuel ratios: 0.8 (rich), 1.0 (stoichiometric), and 1.2 (lean). [4 marks]