The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programme	:	Diploma in Technology/Bachelor of Technology (Engineering)
Name of the Examination	:	Final Examination
Course Code and Title	:	**MEX4232 Automobile Technology**
Academic Year	:	2012/13
Date	:	10th August 2013
Time	:	0930 hrs. – 1230 hrs.
Duration	:	3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 8 questions. All questions carry equal marks.
3. Answer any 5 questions only.

QUESTION 01

(i) Draw a typical valve timing diagram for a single cylinder, four stroke, spark ignition engine and explain the sequence of valve opening and closing. Indicate valve overlap on the diagram.

(ii) Draw a p-V diagram for a diesel engine operating on the dual combustion cycle and identify the processes involved.

(iii) Why is it necessary to have multi cylinder engines instead of single cylinder engines in automobiles? Explain briefly.

QUESTION 02

(i) Explain the term volumetric efficiency with regard to operation of internal combustion engines.

(ii) What is meant by "Piston Slap"? Explain.

(iii) 1.6 litre, four cylinder gasoline engine has a clearance volume of 2.5×10^{-5} m^3 per cylinder. What is the compression ratio?

If this engine consumes 16.07 kg of gasoline per hour when developing 60 kW of brake power, determine the brake thermal efficiency of the engine. Take calorific value of gasoline as 45 MJ/kg.

QUESTION 03

(i) How do you conduct a "Morse Test" to determine the indicated power of a multi cylinder engine? Explain.

(ii) A four cylinder, four stroke, spark ignition engine with a cylinder bore of 80 mm and a stroke of 100 mm was tested on an engine dynamometer and the following results were obtained.

Engine speed	– 3600 rev/min
Brake torque	– 125 Nm
Rate of consumption of fuel	– 0.26 litres/min
Specific gravity of fuel	– 0.8
Calorific value of fuel	– 45 MJ/kg

Determine the brake power, brake mean effective pressure and brake thermal efficiency of the engine.

If the engine has a compression ratio of 12 and its indicated thermal efficiency is only 60% of that of the corresponding air standard Otto cycle, determine the mechanical efficiency of the engine. Take $\gamma = 1.4$ for air.

QUESTION 04

(i) Fig. Q4 shows a sketch of a modern electronically controlled common rail diesel fuel injection system. Identify the components numbered 1 to 15 and briefly explain the operating principle.

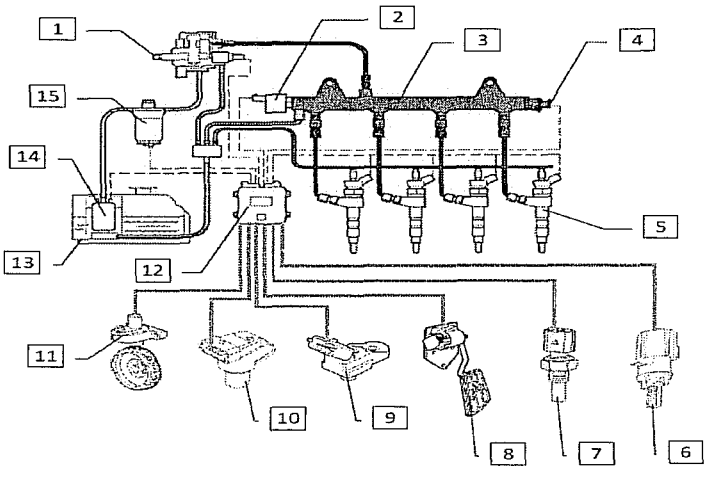


Fig. Q4

(ii) Briefly describe the advantages and disadvantages of common rail diesel fuel injection system over distributor type fuel injection pump.

(iii) What reasons can you attribute for almost complete replacement of conventional carburetor engines with EFI engines?

QUESTION 05

(i) There are many types of air flow sensors used in modern automobiles. Describe the construction and operation of two such types with appropriate sketches.

(ii) Explain the most important functions of a lubricating system.

(iii) State the advantages of pressurized cooling systems over other cooling systems.

QUESTION 06

(i) What is meant by "Cooling Load" as applicable to air conditioning of automobiles? Explain.

(ii) Explain, with the aid of a graph, the variation of HC, CO and NO_x concentrations with the air/fuel ratio, in the exhaust gas of a non emission controlled gasoline engine.

(iii) What is the necessity for fitting an exhaust muffler to an internal combustion engine?

QUESTION 07

(i) What is the need to have a gear box in a motor vehicle? Explain.

(ii) Describe the working principle of a fluid flywheel with sketches where necessary.

(iii) Draw a sketch of an independent front suspension system suitable for a small passenger car and label its components.

QUESTION 08

(i) What are the advantages and disadvantages of disc brakes over drum brakes?

(ii) Explain the construction and operation of the Rack and Pinion type steering mechanism with the aid of sketches.

(iii) What reasons can you attribute for the abnormal wear of a tyre? Explain.

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