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	:	2014/15
Date	:	12th September 2015
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

(a) Calculate the stroke length of a single cylinder engine if the bore diameter is 110 mm, the clearance volume is 0.13×10^{-3} m^3 and the compression ratio is 19.

(b) By means of sketches, explain the difference between single overhead camshaft (SOHC) engine and dual overhead camshaft (DOHC) engine designs.

(c) Explain the following terms with respect to a compression ignition internal combustion engine.

i) Indicated mean effective pressure
ii) Volumetric efficiency
iii) Specific fuel consumption
iv) Turbo inter-cooling

QUESTION 02

(a) Explain the following terms with respect to an automobile fuel.

i) Cloud point
ii) Pour point
iii) Flash point
iv) Fire point

(b) By means of a rough sketch, explain the operating principle of a conventional distributor type ignition system.

(c) Explain why it is necessary to vary the ignition timing according to speed and load.

(d) Explain how the ignition timing is varied by means of a vacuum advance mechanism.

QUESTION 03

A three cylinder four stroke spark ignition engine with a cylinder bore diameter of 90 mm and a stroke of 110 mm was tested on an engine dynamometer and the following results were observed.

Engine speed	- 3200 rev/min
Brake torque	- 120 Nm
Volume flow rate of fuel	- 0.14 liters/min
Volume flow rate of air	- 1.78 m^3/min
Specific gravity of fuel	- 0.82
Calorific value of fuel	- 45,000 kJ/kg

Determine the following parameters of the engine.

i) Brake power
ii) Brake mean effective pressure
iii) Brake thermal efficiency
iv) Volumetric efficiency

QUESTION 04

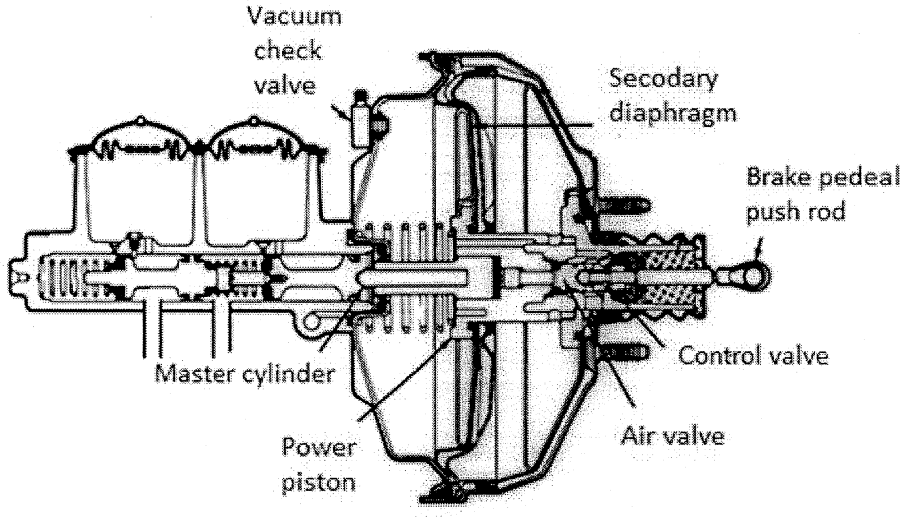


Fig. Q4 - Brake master cylinder and a brake booster

A typical brake master cylinder and a brake booster is shown in the Fig. Q4.

(a) Explain the operating principle of the master cylinder.

(b) Using a rough sketch, explain the operating principle of a conventional hydraulic brake system.

(c) Explain how the brake booster assists in the operation of brakes.

QUESTION 05

Diagnose the possible causes of the problem given below with logical explanation.

"The engine of my diesel car does not start now and then. The starter motor turns but sometimes the engine does not start. It seems to have plenty of power from the battery, (lights, etc. all work)."

QUESTION 06

(a) A pictorial view of a torque converter is shown in Fig. Q6

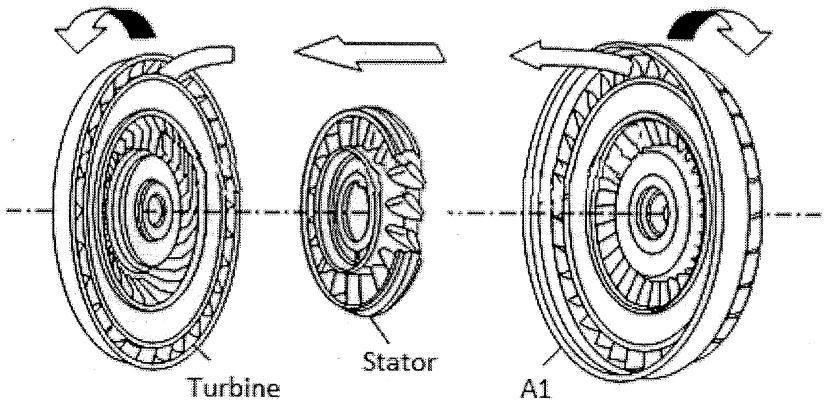


Fig. Q6 - Pictorial view of a torque converter

i) Identify the component indicated by A1.
ii) By means of a sketch explain the flow of fluid within the torque converter.
iii) Explain the difference between the fluid flywheel and the torque converter.

(b) With aid of sketches, explain "caster, camber, toe in-out" in relation to the wheel alignment of an automobile.

QUESTION 07

(a) Graphically explain the variation of HC, CO and NOx concentrations in the exhaust gas against the air/fuel ratio for a gasoline engine. (Assume that exhaust gases are not treated with an after treatment system).

(b) A spark ignition engine consumes fuel at a rate of 0.216 kg/min when developing 48 kW of brake power. The engine has a mechanical efficiency of 80%. Calculate the brake thermal efficiency and the indicated power of the engine. Take Calorific value of gasoline as 45000 kJ/kg.

QUESTION 08

(a) A pictorial view of an automotive clutch is shown in Fig. Q8.

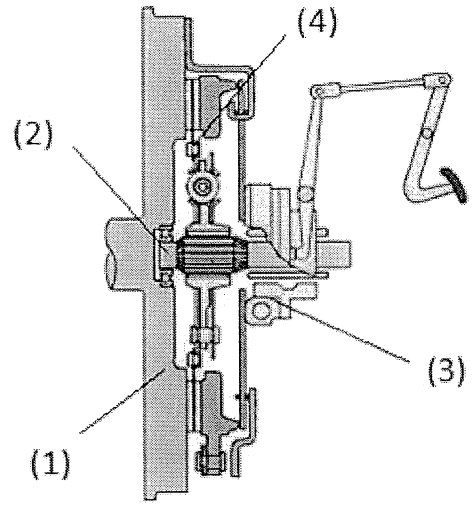


Fig. Q8 - Pictorial view of an automotive clutch

i) Identify the components 1,2,3, and 4.
ii) Explain the operating principle of the clutch.
iii) List three main properties required for the brake lining material.
iv) List four major functions of a clutch.

(b) Explain how the engine indicated power can be determined by using an engine dynamometer.

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