00078

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
DIPLOMA IN TECHNOLOGY – LEVEL 4
FINAL EXAMINATION

MEX 4232 -AUTOMOBILE TECHNOLOGY

DATE : 11th December 2016
TIME : 09:30 to 12:30 hrs
DURATION : THREE HOURS

READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTION PAPER

Instructions.: This question paper consists of seven (07) questions. You are required to answer any six (06) questions. All questions carry equal marks.

Question 01

a) Briefly explain the effect of excessive ignition timing delay on power output of a spark ignition engine.

b) Explain the following terms with respect to a compression ignition internal combustion engine.
   i. Compression ratio
   ii. Volumetric efficiency
   iii. Specific fuel consumption
   iv. Brake power

c) Identify the major constructive differences in the arrangements shown in Figure Q1(a) and Figure Q1(b) and state the advantages of configuration shown in Figure Q1(a) over the configuration shown in Figure Q1(b).

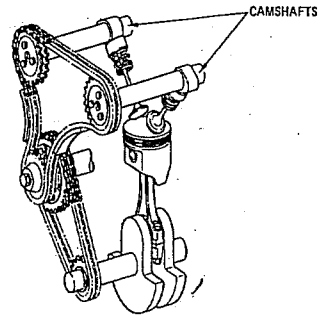


Figure Q1(a)

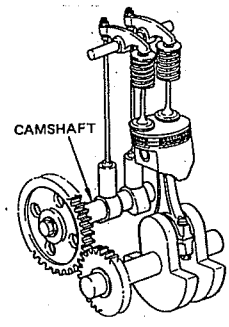


Figure Q1(b)

Question 02

a) A schematic diagram of a power steering system is shown in Figure Q2. Explain the operating principle of a power steering system referring to the figure.

b) List three advantages of electronic power steering over conventional hydraulic power steering.

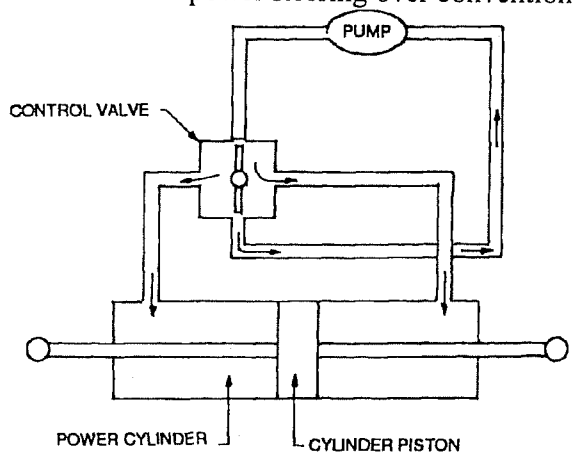


Figure Q2

c)

i. Name three different types of Friction clutches employed in motor vehicles.
ii. Explain the working theory of the centrifugal clutch with the aid of sketches.
iii. Explain briefly the working theory of the torque converter.

Question 03

(a) Explain the operating principle of the rack and pinion gear and re-circulating ball and nut steering mechanism shown in Figure Q3.1 and Figure Q3.2.

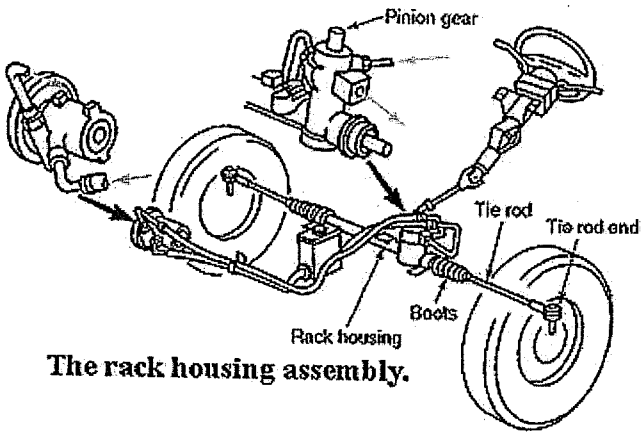


Figure.Q3.1

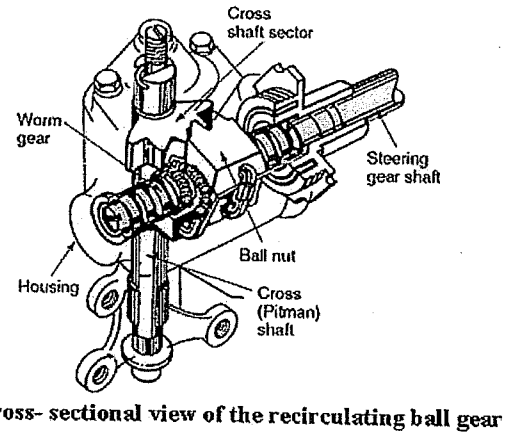


Figure.Q3.2

i. A distributor-less ignition system of a spark ignition engine is shown in Figure Q3.3. Explain the operating principle of a conventional distributor type ignition system

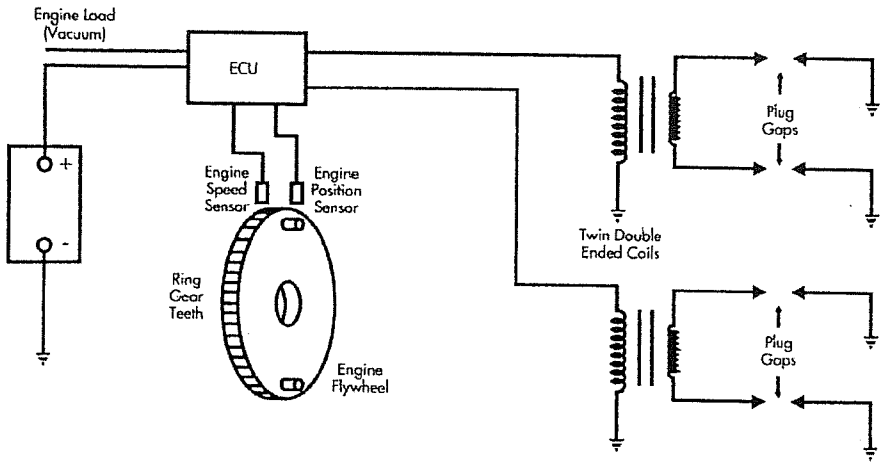


Figure Q3.3

Question 04

A four-cylinder petrol engine has a bore of 88 mm and a stroke of 110 mm. It is tested on an engine dynamometer which has a torque arm of 0.45 m at 4200rpm. The net brake load on the arm is 145 N and the fuel consumption is 9.34 l/h. The specific gravity of the petrol used is 0.82 and its calorific value is 45000 kJ/kg.

Calculate the following.

i. Engine torque
ii. Brake power
iii. Brake mean effective pressures (BMEP)
iv. Volume flow rate of fuel
v. Mass flow rate of fuel
vi. Brake thermal efficiency

Question 05

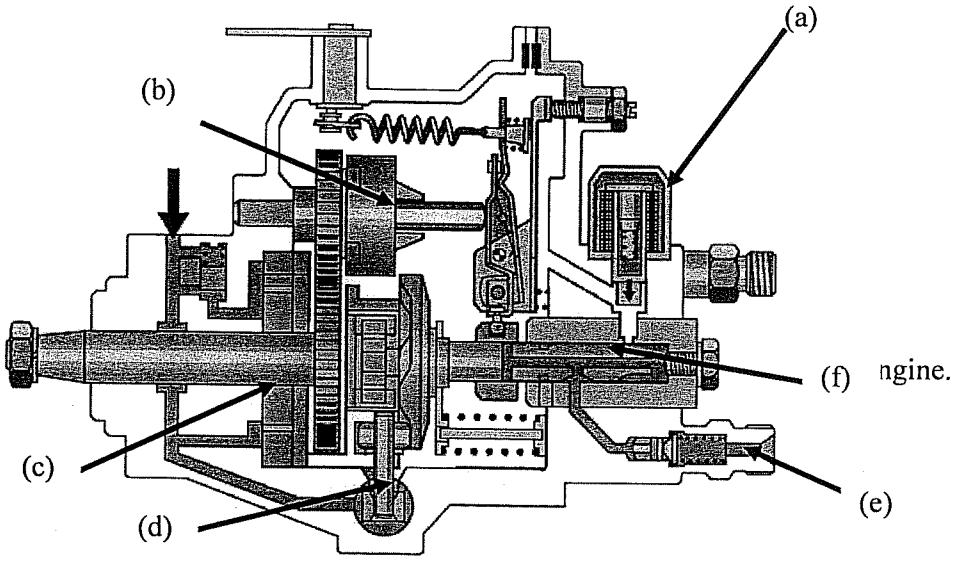
A four cylinder four stroke engine was tested in an engine dynamometer. During the test, the engine consumed 2.127 kg of fuel per second and developed 65.25 Nm at 4200 rev/min. A morse test is carried out for the engine and the cylinders are cut out in the order of 1, 2, 3, 4 with corresponding brake torques of 45, 48, 46.5 and 44 Nm, respectively at 4200 rev/min.

Calculate the following.

i. Indicated power
ii. Specific fuel consumption in kg/kWh
iii. Mechanical efficiency
iv. Indicated mean effective pressure (IMEP)

Question 06

(a) Identify the components (a – f) of the fuel injection pump shown in the FigureQ7.



ngine.

Figure Q7

(b) Explain the meaning of cooling load regarding air conditioning systems of automobiles

Question 07

(a) What are the two basic types of pneumatic tyres presently used in motor vehicles? Explain their construction.

(b) Figure Q8 show the construction of an automobile engine piston. Explain why the boss for the piston pin is located with a slight offset to the centre line.

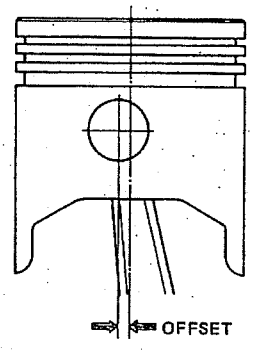


Figure Q8- Piston of an Automobile Engine

(c) With the aid of a sketch, explain dwell angle.

All Rights Reserved