The Open University of Sri Lanka Faculty of Engineering Technology



Study Programme

: Bachelor of Technology Honours in Engineering

Name of the Examination

: Final Examination

Course Code and Title

: DMX5208/DMX6531 - Automobile Engineering

Academic Year

: 2021/22

Date Time : 17 February 2022 ::14.00 – 17.00 Hrs

Duration

: 3 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

Figure Q1 shows the arrangement of cranks in a two cylinder in line engine with both pistons on one side and having opposite movements. Let x be the distance between the centre line of cylinder 1 and the reference line and let a be the distance between the centre lines of cylinder 1 and 2.

- a. determine for the configuration shown above the magnitudes and directions of,
 - i. Primary couples (M_p)
 - ii. Secondary couples (M_s)
 - iii. Couples due to revolving masses (MR)
- b. Magnitude of mass of M each at radii R in diametrically opposite positions at a distance of a.

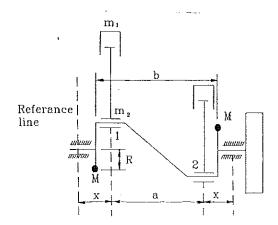


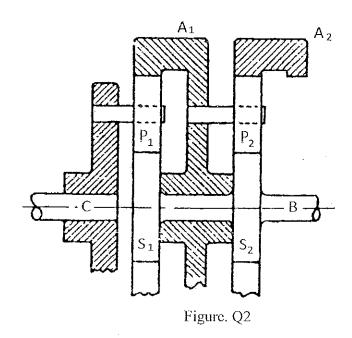
Figure Q1

Page 1 of 3

Question 02

Figure Q2 shows an epicyclic gear box. The pinions S_1 and S_2 are driven directly from the engine by the shaft B and gear through pinions P_1 and P_2 , with the annular wheels A_1 and A_2 . These annular wheels may be locked in turn to give two speeds to the driven shaft C. The first speed occurs when A_1 is locked and the second speed occurs when A_2 is locked. The pinion P_2 rotates freely on a pin carried by A_1 and P_1 rotates freely on a pin carried by the arm which is keyed to the driven shaft C. Assuming that the number of teeth on A_1 to be equal to that on A_2 and that the number of teeth on S_1 and S_2 to be equal, find

- a. the ratio of the number of teeth on A₁ to the number of teeth on S₁ when the second speed is 1.75 times the first speed and in the same direction.
- b. first and second gear ratio.
- c. first and second speeds for this ratio when the engine speed is 3400 rev/min.



Question 03

Modern ABS/Traction control systems are capable of performing additional functions such as , Anti-Lock Braking System (ABS), Corner Brake Control, Electronic Brake Force Distribution , Automatic Stability Control , ASC Sub-functions Engine Drag Torque Reduction, Dynamic Stability Control (DSC), DSC Sub-functions Dynamic Brake System (DBS).

- a. List the sensors involved in accomplishing the above tasks in the automotive control system.
- b. Briefly explain each function listed above.

Question 04

- A four cylinder SI four stroke engine with a 1.8 liter displacement volume operates at Wide Open Throttle (WOT) on air standard Otto cycle at 2800 rev/min with following operating parameters.
- compression ratiomechanical efficiency
- Stroke to bore ratio (s/b) 1.12
- Air Fuel ratio

-15:1

- 8:1

-86%

Heating value of fuel

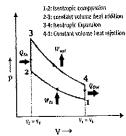
-44500 kJ/kg

• You may assume that the combustion efficiency is 100%, at the start of compression stroke, conditions in the cylinder combustion chamber are 100 kPa and 60°C and 5% of exhaust residual is left over from previous cycle.

Do a complete thermodynamic analysis of the engine for one cylinder and determine the following:

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23: constant pollogic best addition

- a. bore diameter and stroke of the engine
- b. V₁ T₁ P₁
- c. $V_2 T_2 P_2$
- d. heat added per cylinder per cycle



Question 05

- a. Compare and contrast the common rail diesel fuel injection system with distributor type conventional diesel fuel injection system.
- b. Explain the consequences of incorrect injection timing of a compression ignition system.

Question 06

- a. Explain the features of methanol as an alternative fuel for automobiles.
- b. Explain the main features and methods used for combustion in a gasoline direct injection engine.

Question 07

A six cylinder, four stroke engine of 123 mm bore, 128mm stroke and with a compression ratio of 7 is tested at 4300 rpm on a dynamometer which has 70 cm arm to measure the torque. During a test, the dynamometer torque arm scale reading was 850N and the engine consumed 1.2 kg of gasoline per minute having a calorific value of 44,000 kJ/kg. Air at 27 C and 1 bar was supplied at a rate of 15 kg/min. Find

- a. the brake power, kW
- b. the brake mean effective pressure, N/m2
- c. the brake specific fuel consumption, g/kWh
- d. the brake thermal efficiency

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