UNIVERSITY OF RUHUNA

Faculty of Engineering

End - Semester 4 Examination in Engineering: November 2022

Module Number: ME 4211 **Module Name: Automobile Engineering (C-18)**

[Three Hours]

[Answer ***all questions***, each question carries ***ten*** marks]

Q1. Figure Q1 shows a Circular Valve Diagram of an Internal Combustion Engine. It is clear from the valve diagram that the inlet and exhaust valves do not close/open exactly at TDC and BDC positions.

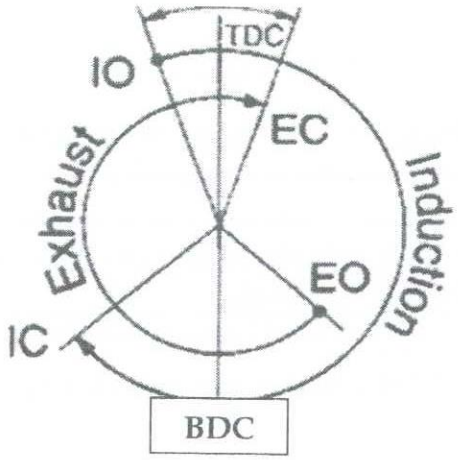

Figure Q1

Hence explain the benefits of the following situations;

(i) Opening of inlet valve before TDC
(ii) Closing of inlet valve after BDC
(iii) Exhaust valve opening before BDC
(iv) Exhaust valve closing after TDC

[10 Marks]

Q2. **(a)** What is the Mean Effective Pressure of an Engine? Explain using a neatly drawn graph.

[4 Marks]

(b) Toyota Premio is a popular car in Sri Lanka. This car's 2018 model basic engine specifications are as follows;

- Engine displacement 1497 cm^3
- Bore x Stroke 75 mm x 84.7 mm
- Compression ratio 10.5
- Maximum power 81 kW @ 6000 rpm
- Peak torque 140 Nm @ 6000 rpm

- Number of cylinders 4
- This is a 4-stroke petrol engine.

Calculate the mean effective pressure of the engine.

[6 Marks]

Q3. **(a)** Vehicle suspension systems can basically be divided into two categories, i.e, Independent and Dependent (Conventional) Suspensions. Use two neatly drawn sketches and differentiate them.

[4 Marks]

(b) Point out the advantages and disadvantages of the two systems above mentioned two systems discussed in Q3(a).

[3 Marks]

(c) What is MacPherson strut suspension? Draw a neat sketch and explain.

[3 Marks]

Q4. **(a)** Spark plugs are used in gasoline engines to ignite the air-fuel mixture. What are the other functions of the spark plug?

[2.5 Marks]

(b) Write a short note about the heat rate of spark plugs and the applications of the different heat rate plugs.

[2.5 Marks]

(c) Why it is important to use a spark plug with the correct reach?

[2.5 Marks]

(d) What is ignition advance? Why is it necessary?

[2.5 Marks]

Q5. **(a)** What are the sources of automobile emissions?

[2 Marks]

(b) Explain why the Crankcase Ventilation is very important.

[2 Marks]

(c) Compare road draft and positive crankcase ventilation systems.

[2 Marks]

(d) If the Exhaust gas after-treatment methods are not been in place, the world would have been facing a much more severe environmental problem. Explain the after-treatment process by the catalytic converters.

[4 Marks]