



## UNIVERSITY OF RUHUNA

### Faculty of Engineering

End-Semester 4 Examination in Engineering: February 2020

Module Number: ME 4311

Module Name: Automobile Engineering

[Three Hours]

[Answer all questions, each question carries ten marks]

All assumptions must be stated clearly. Sketches and diagrams are to be provided where required. Symbols stated herein denote standard parameters.

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- Q1 a) Describe with the aid of neat sketches the four stroke cycle of a single cylinder Gasoline Engine. [3.0 Marks]
- b) A four-cylinder Otto cycle engine has a 90 mm bore, a 100 mm stroke, and a clearance volume of 0.106 litres. Calculate the total engine displacement and the compression ratio. [2.0 Marks]
- c) Discuss a comparison of the following for Spark Ignition and Compression Ignition engines. [5.0 Marks]
- i) Thermodynamic Cycle,
  - ii) Combustion,
  - iii) Compression Ratio,
  - iv) Operating Pressure,
  - v) Air-fuel Ratio.
- Q2 a) Name three types of lubricating systems used in IC engines. List out five functions of a lubricating system. [4.0 Marks]
- b) Give five properties of lubricating oil to meet the requirements of a proper lubricating system. [3.0 Marks]
- c) Draw a sketch of a full pressure lubricating system, name the important parts and briefly explain the operation. [3.0 Marks]
- Q3 a) i) Briefly discuss the operation of brake master cylinder including booster with suitable sketches and details. [1.0 Mark]
- ii) Discuss the need of anti-lock braking system (ABS) for a vehicle with suitable sketches and details. [1.0 Mark]
- b) Anti-lock braking systems can be categorized according to the number of channels and the number of speed sensors. Discuss the six sensors four modulators ABS with suitable sketches and details. [2.0 Marks]

- c) Discuss the need of Traction Control System (TCS system) in modern vehicles. [1.0 Mark]
- d) What is the function of a carburetor in an SI engine? Briefly explain with a neat sketch the operation of a simple float type carburetor. [2.0 Marks]
- e) Name five additional systems which can be added to the simple carburetor to satisfy the fuel demands of an engine under all running conditions. [3.0 Marks]
- Q4 a) Discuss the functions and necessity of a transmission system in an automobile. [2.0 Marks]
- b) What are the types of transmission systems available in vehicles? Discuss the working phenomena of synchromesh transmission system. [2.0 Marks]
- c) Discuss the torque converter operations and applications with suitable sketches and details. [2.0 Marks]
- d) Discuss the advantages of tubeless over tubed tyre and the need of solid tyres/airless tyres? [2.0 Marks]
- e) According to the tyre specification P 205 / 55 V R 16, discuss the characteristics of the tyre. [2.0 Marks]
- Q5 a) Discuss the types of car chassis with suitable sketches and details. [2.0 Marks]
- b) What are the main types of suspension systems available in automobile vehicles? Discuss them with suitable sketches and details. [2.0 Marks]
- c) Discuss the need of upper control arm and lower control arm of a vehicle with suitable sketches and details. [1.0 Mark]
- d) Discuss the need of Stabilizer Bars/ Anti-roll bar in some vehicles with suitable sketches and details. [1.0 Mark]
- e) Steering system plays a major role in automobile vehicles. Discuss the functions and turning principle of steering system. [2.0 Marks]
- f) Wheel alignment of a vehicle helps to enhance vehicles performance and handling, maintain better fuel economy, maintain ride comfort and increase the life expectancy of the tyres. Discuss the wheel alignment process with suitable sketches and details. [2.0 Marks]