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UNIVERSITY OF RUHUNA – FACULTY OF TECHNOLOGY
Bachelor of Engineering Technology Honours
Level 2 (Semester 2) Examination, December 2025
Academic Year 2023/2024

Course Unit: ENT 2242 – Basic Automobile Technology **Duration: 02 Hours**

Instructions to candidates

- This paper contains **4 questions on 4 pages.**
- **Answer all questions.**
- This is a close book examination.
- Electronic communication devices are not permitted, only a calculator is allowed.

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i.

a) In an Internal Combustion Engine, the inlet valve opens 5^0 before the TDC, and exhaust valve remains open after 12^0 from the TDC. What is the valve Overlap? (1 marks)

b) What is the purpose of a "fly wheel" in an Internal Combustion Engine? (2 marks)

c) Name two reasons for having "Piston rings" in an Internal Combustion Engine. (2 marks)

d) Draw the actual Otto Cycle P-V Diagram for a Four-Stroke Engine. (3 marks)

e) A four-cylinder Engine operates on a four-stroke cycle. The firing order is 1-3-4-2. Tabulate the sequence of operations. (3 marks)

f) A four-cylinder four-stroke, spark ignition engine produces an output of 45 kW at a speed of 1800 rpm. The Morse Test was carried out, and the Brake Torque readings obtained were 164, 168, 163 and 166 Nm for the first, second, third, and fourth cylinders of the Engine respectively. During normal running at this speed the specific fuel consumption was 5 g/kW-min, and the Lower Calorific Value (LCV) of the fuel was 42.5 MJ/kg. Calculate the following efficiencies (in percentage),

(14 marks)

i. Mechanical Efficiency ($\eta_{mechanical}$)

ii. Brake Thermal Efficiency (η_{brake})

iii. Indicated Thermal Efficiency ($\eta_{thermal}$)

2.

a) Briefly describe your understanding of the following questions

i. Exhaust Gas Recirculation (EGR) (2 marks)

ii. Mass Air Flow (MAF) Sensor (2 marks)

iii. O_2 Sensor (Lambda Sensor) (2 marks)

iv. Pressure Control Valve (PCV) (2 marks)

v. Suction Control Valve (SCV) (2 marks)

vi. Positive Crankcase Ventilation (PCV) system (2 marks)

b) State the major difference between direct injection and indirect injection systems. (3 marks)

c) Draw the block diagram of a Common Rail Direct Injection (CRDI) System. (4 marks)

d) Write the difference between Electronic Fuel Injection (EFI) and Common Rail Direct Injection (CRDI) using three Parameters/Features. (6 marks)

3.

a) What are the main Components of Transmission System. (3 marks)

b) What are the types of Gearboxes? (3 marks)

c) Briefly explain the following parts of an Internal Combustion Engine.

i. Torque Converter (2 marks)

ii. Thermostat Valve (2 marks)

d) Draw the schematic arrangement of the Cooling System of an Internal Combustion Engine (5 marks)

e) The driver has reported that his manual-transmission vehicle has difficulty engaging gears while driving. As the Workshop Engineer, describe the steps you would take to diagnose and troubleshoot this issue. (10 marks)

4.

a) Explain the Ackermann Principle. (2 marks)

b) Derive the following formula using a suitable sketch and the terms L,W, α_i, α_o represent the vehicle Wheelbase, Wheel Track, Inner Angle of the wheel and Outer Angle of the wheel respectively.

(4 marks)

$$\text{Cot}\alpha_o - \text{Cot}\alpha_i = \frac{W}{L}$$

c)

i. What is the energy conversion of the shock absorber? (1 marks)

ii. What is the Condition-Based Maintenance Rules for Wheel Alignment ?

(2 marks)

iii. What is Ply Rating (PR) Number of the Pneumatic Tyre? (2 marks)

iv. Explain the terms of the following Tyre number (4 marks)

P 215/65 R 15 89 H

v. Draw a rough sketch and label Positive Caster and Negative Caster angles. (4 marks)

d) Write the differences between Straight Axle Overslung and Straight Axle Underslung using three Parameters/Features. (6 marks)

*****End of the Paper *****