UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 4 Examination in Engineering: November 2017

Module Number: ME4312 **Module Name: Automobile Engineering**

[Three Hour]

[Answer **all questions**, Total of **fifty (50)** marks for all questions]

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

Q1. a) **Internal combustion engines** can be classified into several sub components according to the functions of them. Describe five (5) of them with relevant details in point form. [2.0 Marks]

b) With the aid of suitable sketches, describe **nine (9)** major components of **4-stroke** and **2-stroke** gasoline engine with the important **positions** of the piston. [2.0 Marks]

c) Sketch the P-V diagram for 4-stroke petrol engine with all relevant data, including ignition point, intake valve opening/closing and exhaust valve opening/closing. [2.0 Marks]

d) Compare 2-stroke & 4-stroke engines with their pros and cons. [1.0 Marks]

e) Calculate the **mechanical efficiency** of a Rolls-Royce Merlin engine (**4-stroke 12-cylinder**) where **mean effective pressure** is **23.1 bar, stroke** is **152 mm, bore** is **100mm**, engine **speed** is **2900 r.p.m.** and **brake power** is **650kW**. [3.0 Marks]

Q2. a) List the **three** types of **lubricating systems** and **five functions** of that. [1.0 Marks]

b) Briefly describe the **properties** of **lubricating oils**. [1.0 Marks]

c) Describe the **necessity** of engine **cooling system** in point form and describe **different types** of **cooling systems** with suitable details. [2.0 Marks]

d) What are the four categories of **solid injection system?** Describe them briefly. [2.0 Marks]

e) What are the **components** in **primary** and **secondary circuit** in **the ignition system?** Describe the working mechanism of the ignition coil. [2.0 Marks]

f) Describe the **electronic ignition system** and **distributorless ignition system.** [2.0 Marks]

Q3. a) **Describe** the purpose and **principle** of the **braking system**. [1.0 Marks]

b) What is **Antilock Braking System (ABS)**? Describe it with its primary components. Give examples for the types of **ABS**. [2.0 Marks]

c) What are the **requirements** of the **wheel system** and **factors** that affect the **lifetime** of a tyre? [2.0 Marks]

d) Give some reasons for the **popularity** of **pneumatic tyres against solid tyres**. What are the advantages of **tubeless** over **tubed Tyre?** [3.0 Marks]

e) Describe pros and cons of **air** inflated and **nitrogen** inflated of tyres. [2.0 Marks]

Q4. a) What are the basic **functions** of a transmission system? [1.0 Marks]

b) Describe the **types of transmission systems** with the aid of suitable sketches. [3.0 Marks]

c) What is **torque converter**? [1.0 Marks]

d) A four forward speed gear box shown in **Figure Q4(d)** is to be prepared for providing gear ratios of 1.0, 1.8, 2.5 and 4.2 approximately. (Neglect the reverse gear) The module of each gear is 4 mm and the smallest pinion is to have at least 15 teeth. The center distance between main shaft and counter shaft is 70 mm. Determine the number of teeth of each gear and **exact** gear ratios. [5.0 Marks]

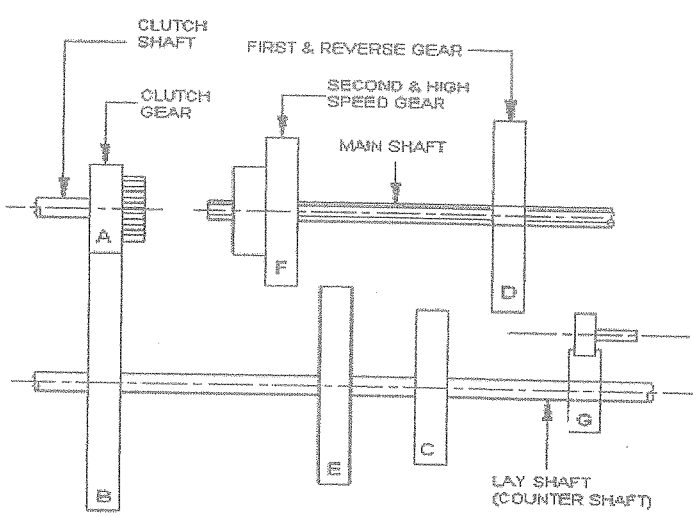
Q5. a) List out **five functions of steering system?** [1.0 Marks]

b) With the aid of suitable sketches, explain the turning of a vehicle wheel. [2.0 Marks]

c) What is **linkage steering system** and **power steering system**? [2.0 Marks]

d) List out the common **suspension systems** which are used in vehicles. Explain **two** of them. [2.0 Marks]

e) The most common wheel **alignment** checking angles are **caster** angle, **camber** angle, **thrust** angle and **toe** angle for better manoeuvring of the vehicles. **Describe** them with the aid of suitable sketches. [3.0 Marks]



FigureQ4 (d)