



# UNIVERSITY OF RUHUNA

## Faculty of Engineering

Mid-Semester 6 Examination in Engineering: November 2014

Module Number: ME6318

Module Name: Advanced Fluid Mechanics

[Two Hours]

[Answer all questions, each question carries five marks]

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- Q1 a) What are the drag forces acting on a moving body immersed in a fluid? Also explain that how these forces affecting to motion of the body.  
[2 Marks]
- b) Discuss the methods that can be used to reduce drag forces on a moving body.  
[1 Mark]
- c) By drawing a clear graph of drag force vs. Reynolds number explain the variation of drag force on a ball with respect to wind velocity  
[2 Marks]
- Q2 a) A van with a round front face has a parallelepiped shape. The vertical projection of the front face is a 2 m x 2.5 m rectangle. The effective length of the van is 3 m. If the van moves at a speed of 120 km/hr in a straight road, find the air resistance on the van and the power needed to overcome this resistance. The density and viscosity of air are  $1.176 \text{ kg/m}^3$  and  $18.62 \times 10^{-6} \text{ Pa.s}$ . The drag coefficient,  $C_D$ , for the round front face is 0.42. Neglect the drag due to the bottom side of the van.  
[5 Marks]
- Q3 a) What are the advantages of using hydraulic power transmission system over other forms of power transmission systems?  
[1 Mark]
- b) The hydraulic reservoir acts as a storage vessel for the fluid in a hydraulic system. List and explain three other functions of a reservoir.  
[1 Mark]
- c) Explain why the pressure control valves require a reverse free flow check valve when it is mounted between the Directional Control Valve (DCV) and the actuator.

[1.5 Marks]

d) Draw the symbol of the sequence valve and explain the functions of it.

[1.5 Marks]

Q4

Figure Q4 shows a schematic diagram of a Hydraulic Two-post vehicle lifter. The vehicle holder is lifted by two double acting linear actuators mounted on the two posts. Design a hydraulic circuit incorporating the following basic features:

- (i) When lowering the vehicle, back pressure should be provided for both actuators.
- (ii) The actuators hold the vehicle load with pump turned off.
- (iii) Both actuators are controlled by a lever operated 4/3 tandem centre DVC.
- (iv) The circuit should be contained with suitable auxiliary devices necessary for safe operation.

[5 Marks]

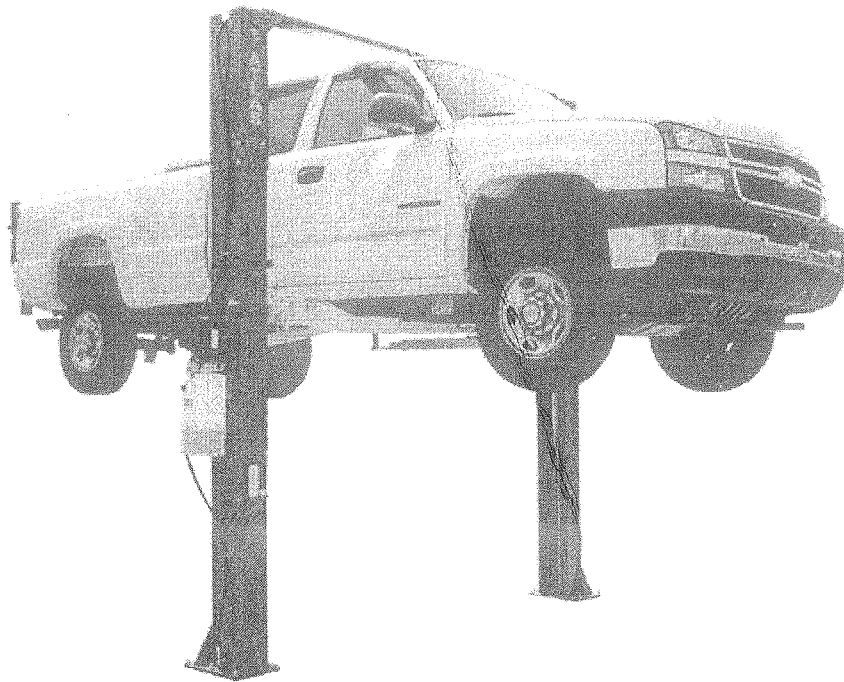


Figure Q4