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EE539 Aerospace Power Electronics and Actuation Systems (2019)

Question 1 (25 marks)

Briefly explain the functions of the following wing surfaces

1. Rudder - primary control. yaw control. turn left or right
2. Aileron - primary control. roll control. roll left or right
3. Elevator - primary control. pitch control. nose point up and down
4. Speed brake - To increase wing drag. To reduce speed and lift
5. Slat and Flap - To increase wing surface for landing and take-off

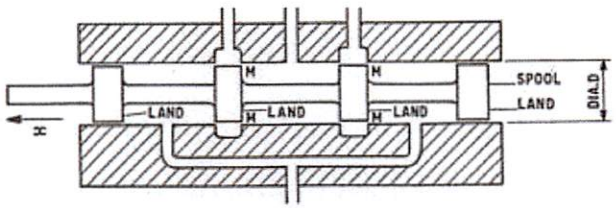
Question 2 (25 marks)

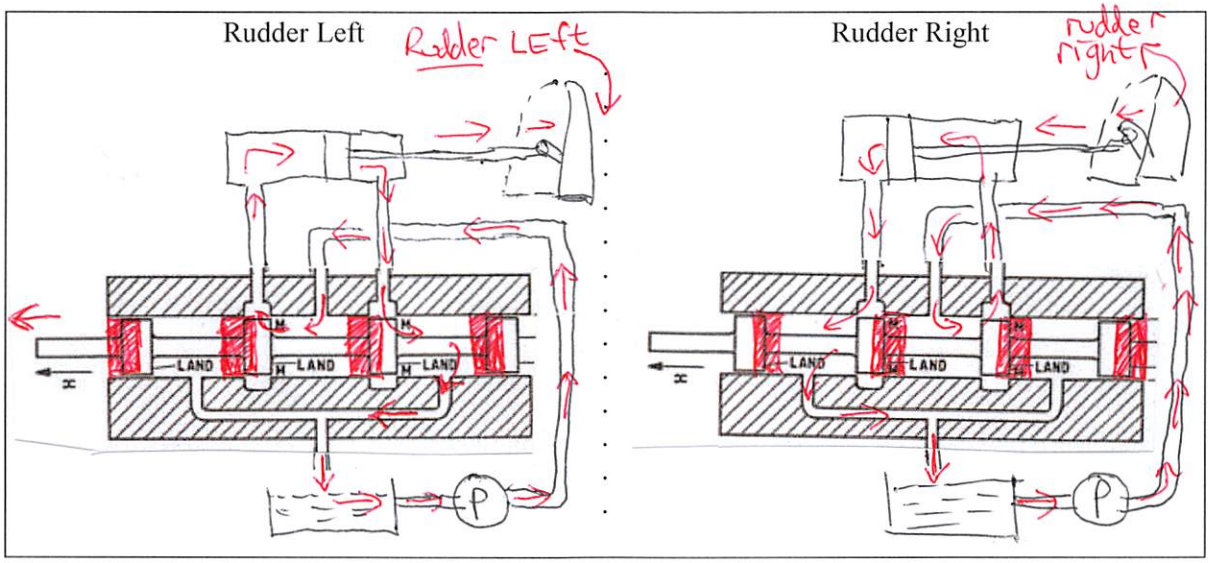
3 major advantages of swash type pump, over single cylinder cam shaft pump, for aircraft application.

1. Net movement is rotational. No in/out vibration
2. Contains multiple cylinders. One cylinder breakdown will not cause total malfunction.
3. Flexible structure. By adjusting the swash plate pump characteristic can change

Question 3 (25 marks)

Draw two diagrams (rudder left and rudder right) to explain how this device can be used to move the rudder, together with the piston, torque motor, and other hydraulic components.





Question 3 (25 marks)

3 major differences between a "Freestanding Displacement Gyroscope" and a "Restrained Rate Gyroscope"

1. 2 axis (freestanding) vs 1 axis (Restrained)
2. Position output (freestanding) vs Force output (Restrained)
3. Slow response (freestanding) vs Fast response (Restrained)

End of Test. Make sure you put your name and student number on this answer script.