

**Question 1**

Fig. Q1 shows the hydraulic system of the primary controls of an aircraft.

- (a) In the primary flight control of an aircraft, there is always redundancy to ensure safety. With regard to the elevator unit, explain what happens (i) when there is a pump failure, (ii) when there is a servo valve control failure, and (iii) when there is a hydraulic fluid leakage? (10 marks)
- (b) Explain with the use of a diagram, how the movement of a small servo valve can control the flap surface of the elevator wing. (10 marks)

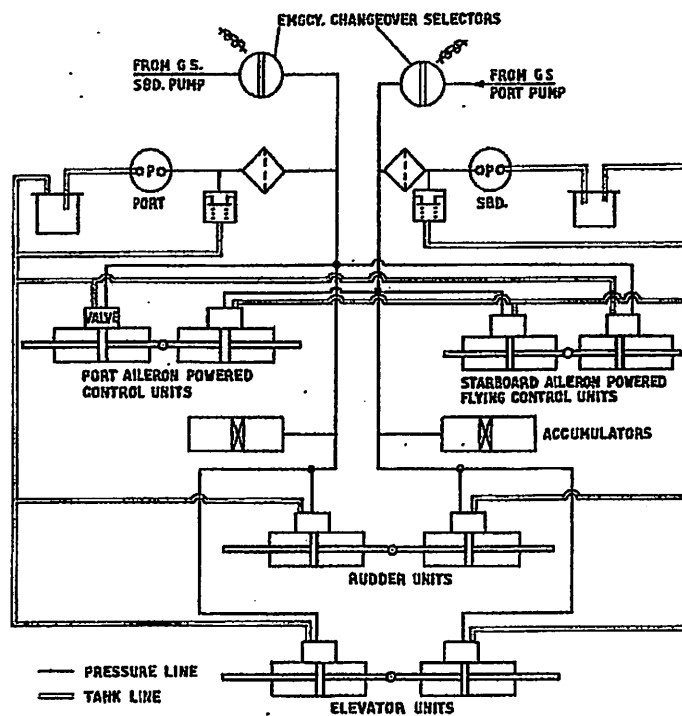


Fig. Q1

**Question 2**

- (a) Compare the differences between a displacement gyroscope and a rate gyroscope, in terms of:
  - (i) Their structures and operating principles;
  - (ii) Their sensing parameters and interface techniques; and
  - (iii) Their applications in the aircraft. (10 marks)
- (b) Magnetic flux based sensors are used in the aircraft to sense rotary and linear wing flaps movements. Describe the structure of such a (i) rotary sensing device, (ii) and a linear sensing device. Why are they preferred over other sensing technologies (i.e. optical, magnetic, and resistive)? (10 marks)