

**4. Cool**

- a. A heat exchanger or ..... is used in rotating machinery to transfer heat between two fluids without direct contact between them.
- b. The ..... of regulator elements refers to the method used for removing heat generated in the regulating process.
- c. In an electron device, a metallic part or fin extends the .....area to facilitate the dissipation of the heat generated in the device.
- d. Air may be used as a..... to remove heat from a machine.

**5. Change**

- a. Modification refers to the ..... of control signals according to the results of the identification and decision.
- b. If parameters are..... rapidly, a procedure known as alternate biasing is employed.
- c. Adaptive control systems are designed to modify the control signal as the system environment ..... so that performance is always optimal.
- d. Feedback allows us to cope with a..... environment by adjusting our actions in the presence of unforeseen events.

**C. Fill in the blanks with the following words.**

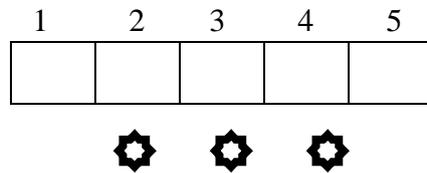
parameters	feedback	control	case
inaccurate	external	given	

An advantage of the closed-loop ..... system is the fact that the use of ..... makes the system response relatively insensitive to..... disturbances and internal variations in system ..... . It is thus possible to use relatively ..... and inexpensive components to obtain the accurate control of a/an ..... plant, whereas doing so is impossible in the open-loop .....

**D. Put the following sentences in the right order to form a paragraph. Write the corresponding letters in the boxes provided.**

- a. Some systems may have multiple inputs and multiple outputs.
- b. A system may have one input and one output.
- c. Such a system is called a single-input, single-output control system.
- d. An example of such multiple-input, multiple-output systems is a process control system that has two inputs (pressure input and temperature input) and two outputs (pressure output and temperature output).

- e. An example is a position control system, where there is one command input (desired position) and one controlled output (output position).



**Section Two: Further Reading**

## Examples of Control Systems

**Speed Control System.** The basic principle of a Watt's speed governor for an engine is illustrated in the schematic diagram of Figure 11-1. The amount of fuel admitted to the engine is adjusted according to the difference between the desired and the actual engine speeds.

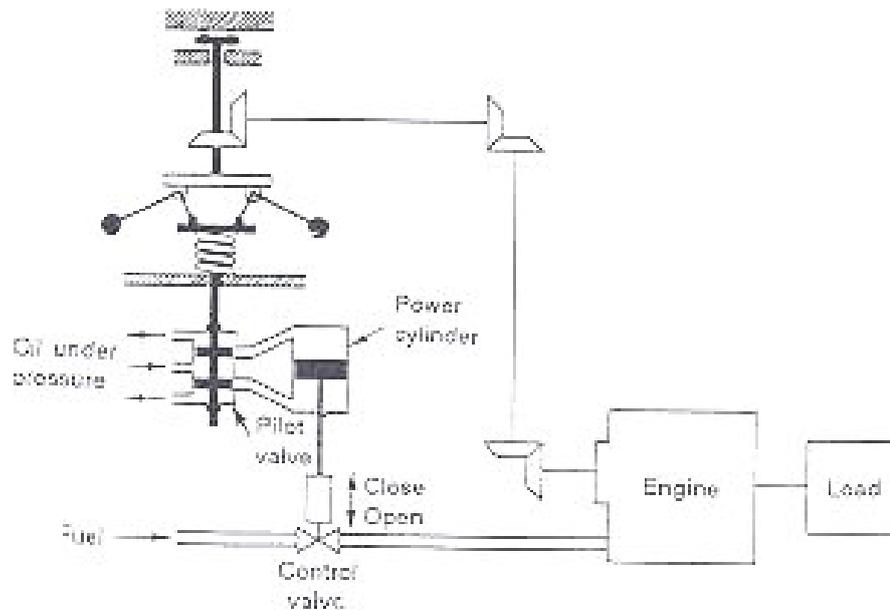


Figure 11-1. Speed Control System

The sequence of actions may be stated as follows: The speed governor is adjusted such that, at the desired speed, no pressured oil will flow into either side of the power cylinder. If the actual speed drops below the desired value due to disturbance, then the decrease in the centrifugal force of the speed