

UNIT-I-FLUID POWER SYSTEMS AND FUNDAMENTALS
QUESTION BANK - I

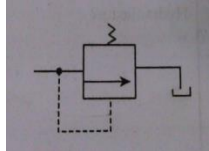
PART-A

(10 x 2 = 20)

1. List out any four desirable properties of hydraulic fluids.

(i) Stable *viscosity* (ii) Viscosity *index* (iii) Good *Lubricity* (iv) Compatibility
(v) Stable physical and chemical characteristics (vi) Non-Toxicity

2. Draw the symbol of pressure relief valve.



3. Define fluid power.

It is the technology that deals with the *transmission, generation* and *control of power* using pressurized fluids

4. What are the basic components of a fluid power system?

Hydraulics: Tank, Pump, Motor, Filter, Indicator etc.

Pneumatics: Compressor, FRL Unit, Valves, Actuators etc.

5. Why air is preferred in fluid power systems compared to other gases?

Since air is *easily available, no investment* is required, non-toxic, non-explosive air is being widely used.

6. Name the different types of fluid power systems.

(i) Based on air. (It is *pneumatics* system)

(ii) Based on oil. (It is *hydraulics* system)

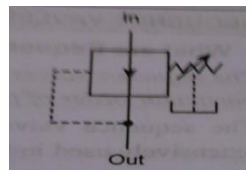
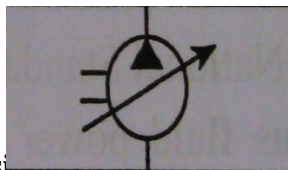
(iii) Based on combination of both oil and air. (It is *pneumo-hydraulics* system)

7. List out any four advantages of fluid power.

(i) Ease and accuracy of *control* (ii) Multiplication of *forces*

(iii) Constant force and *torque* (iv) *Simplicity*, safety and economy.

8. Show the symbol for variable displacement pump and pressure reducing valve.



9. Define viscosity index.

Rate of change of viscosity

Viscosity Index = $\frac{\text{Rate of change of viscosity}}{\text{Rate of change of temperature}}$ (No unit)

10. List out any five fields of applications of fluid power.

(i) *Manufacturing* Industry (ii) *Automobile* Industry (iii) *Agriculture* Industry

(iv) *Naval* Industry (v) *Mechatronics* Fields (vi) Construction Field

PART-B

(4 x 16 = 64)

11. a)(i) How is Pascal's law applied in a hand operated hydraulic jack? Explain with a diagram
(**Keywords: Pascal's law definition, diagram, $F_1 S_1 = F_2 S_2$, Energy i /p = Hydraulic press o/p**)
- (ii) Discuss the principle of working of an air to hydraulic booster.
(**Keywords: Hydraulic booster diagram, Working, Compressed air to higher pressure**)
- b)(i) Distinguish between laminar and turbulent flow
(**Keywords: Laminar = Fluid movement, R_e less than 2000, Stream line flow
Turbulent = Zigzag flow, R_e greater than 4000, continuous fluctuations**)
- (ii) Draw the fluid power symbols of any eight valves
(**Keywords: Diagrammatic representation of any eight valves**)
12. a) (i) Discuss the applications of fluid power systems
(**Keywords: Manufacturing, Automobile, Agricultural, Naval and Aerospace, Mechatronics, and other fields etc.**)
- (ii) Describe the various losses in pipes, valves and fittings in hydraulic systems
(**Keywords: Major loss = Loss due to friction
Minor loss = Due to valves, fittings, bend in pipe, entrance and exit, contraction etc.**)
- b) (i) Describe the advantages of fluid power systems
(**Keywords: Power generation and transmission, infinitely variable speed, load control, accurate feedback, mechanically safe, high power to weight ratio.**)
- (ii) Derive Darcy's equation and how it is significant in hydraulics?
(**Keywords: $H_f = 4fLV^2/2gd$, mainly for calculating major losses in pipes.**)
13. a)(i) Describe the criteria to choose between hydraulic and pneumatic system
(**Keywords: Hydraulics = high power, force multiplication, accurate positioning, safety etc.
Pneumatics = Low power, no leakages, air availability, light weight applications etc.**)
- (ii) Describe the properties of hydraulic fluids
(**Keywords: Stable viscosity characteristics, good lubricity, compatibility, low volatility, in-expensive, good heat dissipation capacity etc.**)
- b. (i) With a sketch describe the construction of a hydraulic power pack.
(**Keywords: Diagram of hydraulic power pack, Explanation of various components like pump, motors, valves, reservoir etc.**)
- (ii) List out the advantages of hydraulic systems
(**Keywords: Safer operation, less wear, offer cushioning for shock loads, high weight ratio**)
- 14.a) (i) Enumerate and briefly discuss the properties and factors considered for selection of oils.
(**Keywords: Stable viscosity characteristics, good lubricity, compatibility with system materials,**

stable physical and chemical properties, heat dissipation capacity etc
Functions of fluid: *To transmit power, lubrication, seal gaps and clearances etc.)*

- (ii) List the advantages of hydraulic systems
(Keywords: Power transmission, amplification, irreversible motion of component, feedback etc.)
- b) (i) Briefly explain the various types of oils used in hydraulic power systems.
(Keywords: Petroleum based hydraulic oils
Non-petroleum based hydraulic oils like water, emulsion, glycols, water glycols etc)
- (ii) Briefly discuss the operation of a manually operated hydraulic jack
(Keywords: Basic hydraulic jack diagram, construction and working principle etc.)