53 (IE 711) FLPC

2018

FLUIDIC POWER AND CONTROL

Paper : IE 711

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. *(a)* What are the fundamental components of a pneumatic system? 2

   (b) What are the advantages and disadvantages of fluid power over other source of power? 4

   (c) A hydraulic cylinder can compress a body to the desired extent in 5 *sec.* This operation requires a 100 inch stroke and 800*lb* force. If a 1000*psi* pump has been selected and the system is having a frictional force of 100*lb*, calculate the required piston area necessary pump flow rate and the hydraulic horse power delivered to the cylinder. 8

(d) Derive the equation of pressure difference at orifice plate junction. 6

2. (a) Describe the working of AIR FILTER, AIR FILTER REGULATION, AIR FILTER LUBRICATOR. 9

(b) A siphon made of 1inch inside diameter pipe is used to maintain a constant level in a 20*ft.* deep tank. If the siphon discharge is 30*ft* below the top of the tank, what will be the flow rate if the fluid level is 5*ft* below the top of the tank. 5

(c) Hydraulic oil ($\upsilon = 100cs$) flows through a pipe of 1inch diameter at a rate of 30*gpm*. What is the equivalent length of 1inch wide open globe valve ($k = 10$) placed in the line? 6

3. (a) Explain the Pumping theory with necessary diagram. 3

(b) Describe the working of External Gear Pump and Axial Piston Pump. 5+5

(c) A pump has a displacement volume of $100cm^3$, it delivers $0{\cdot}0015\ m^3/sec$ at 1000*rpm* and 70*bar*. If the prime mover input torque is 120*Nm*, what is the overall efficiency of the pump? 7

4. *(a)* Describe the working of balanced vane motor. 5

(b) A hydraulic motor has a displacement of 10 $inch^3$ and operate with a pressure of 1000*psi*, speed of 2000*rpm*. If the actual flow rate consumed by the motor is 95*gpm* and the actual torque delivered by the motor is 1500*in.lb*.

Find *(i)* η_v *(ii)* η_m *(iii)* η_0 7

(c) Describe the operation of four way type and shuttle valve. 5+3

5. *(a)* Derive the transfer function of flapper nozzle type pneumatic proportional controller. 10

(b) Explain the different types of Pneumatic Telemetry system with neat sketches. 5

(c) With the help of neat sketch describe an application of pressure relief valve with rupture disk. 5

6. *(a)* Design the LOGIC GATES for AND, OR, MEMORY gate using MPL devices. 6

(b) Explain the phenomena of CAVITATION AND FLASHING in control valve. 6

(c) Describe the working sequence of a two handed press safety system using RS flip flop. 8

7. Write short notes on ***any four*** of the following :

(i) I/P converter

(ii) Screw Compressor

(iii) Three Way valves

(iv) Needle valves

(v) Check valves

(vi) Gas Laws. 20