53 (IE 711) FLPC

2013

(December)

FLUIDIC POWER AND CONTROL

Paper : IE 711

Full Marks : 100

Pass Marks : 30

Time : Three hours

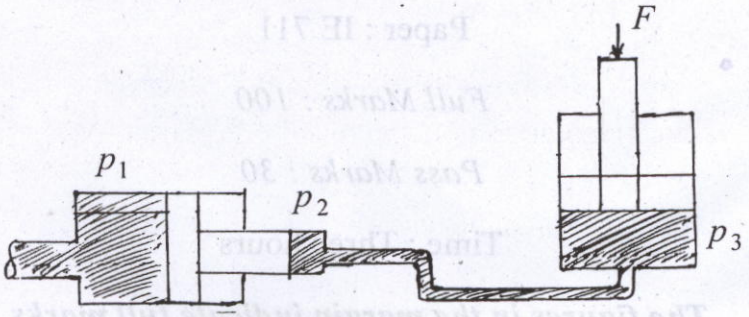
The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Write *any two* applications of fluid power system. Why water is no more used as a fluid in the hydraulic system ? Write *two* advantages of pneumatic system over hydraulic system. 4+1+1=6

   (b) Obtain the expression of velocity of fluid in a siphon. 4

(c) A pressure booster is used to drive a load F via a hydraulic cylinder. If inlet air pressure $(P_1) = 100\ psi$, air piston area $(A_1) = 20\ inch^2$, oil piston area $(A_2) = 1\ inch^2$; load piston area $(A_3) = 25\ inch^2$, determine the load carrying capacity F of the system. 5



(d) At a velocity of 10 *ft/sec,* how many *gpm* of fluid will flow through a $1\ in$ – inside diameter pipe. Also determine the power required by a pump to attain this flow rate if pressure exerted is 10 *psi.* 5

2. (a) Air is used at a rate of 30 *cfm* from a receiver at $90°F$ and $130 psi$. If the atmospheric pressure is 15 *psia* and the atmospheric temperature is $50°F$ how many *cfm* of free air must the compressor provide ? 5

(b) Explain the working of screw compressor. What is the use of aftercooler in pneumatic system ? Describe the different types of air dryers employed in pneumatic system. 5+2+3=10

(c) Explain the working of air pressure regulator with necessary diagram. 5

3. (a) Explain the working of internal gear pump. A gear pump has a 75*mm* outside diameter, a 50*mm* inside diameter and 25*mm* width. If the volumetric efficiency is 90% at rated pressure, what is the corresponding actual flow rate ? The pump speed is 1000*rpm*. 5+5=10

(b) Explain the operation of balanced vane pump.

Find the flow rate in units of *L/sec* that an axial piston pump delivers at 1000*rpm*. The pump has nine 15*mm* diameter piston arranged on a 125*mm* diameter piston circle. The offset angle is set at 10° and the volumetric efficiency is 94%. 5+5=10

4. *(a)* Explain how an external gear motor works. A hydraulic motor has a $5in^3$ volumetric displacement. If it has a pressure rating of $1000psi$ and it receives oil from a $10gpm$ theoretical flow rate pump, find the motor speed, theoretical torque and the theoretical horse power. 5+5=10

(b) Calculate the overall efficiency of a hydraulic motor with displacement of $2cm^3$ which operates with a pressure of 1000 *psi* and a speed of $2000rpm$. The actual flow rate consumed by the motor is $95gpm$. and the actual torque delivered by the motor is $1500in.lb$. 5

(c) Describe the operation of inline piston motor. 5

5. *(a)* Explain the flapper nozzle proportional controller with necessary diagram. 6

(b) Describe the pneumatic telemetering system. 4

(c) Describe the memory operation of a fluidic power system with the help of MPL.

Explain the control sequence of double acting cylinder with interlocks. 2+8=10

6. Write short notes on ***any four*** of the following : 5×4=20

(i) Piston compressor

(ii) Hydraulic jack

(iii) Centrifugal pump

(iv) Three way valve

(v) Simple pressure relief *p* valve.
