College of Engineering & Technology

Department: Mechanical Engineering	Marks: 20
Lecturer: Dr. Rola Afify	Time: 8:30 - 10:00
Course Code: ME464	Date: 11/5/2016

20

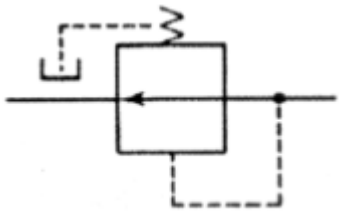
Name: **Model Answer** R.N.:

Answer the following questions:

Question one (10 marks)

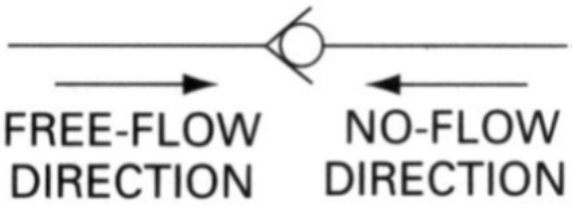
a) For each valve of the following [choose type (Direction control - Pressure control - Flow control) - draw symbol - write function]:-

- **Pressure-reducing valve**



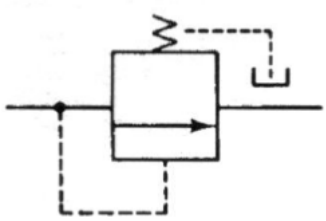
Pressure control valve
It is used to maintain reduced pressures in specified locations of hydraulic systems. It is actuated by downstream pressure and tends to close as this pressure reaches the valve setting.

- **Check valve**



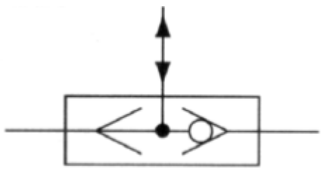
Direction control valve
It permits free flow in one direction and prevent any flow in the opposite direction.

- **Sequence valve**



Pressure control valve
It is designed to cause a hydraulic system to operate in a pressure sequence.

- **Shuttle valve**



Direction control valve
It permits a system to operate from either of two fluid power sources.

- **Needle valve**

Flow control valve
It regulates the speed of hydraulic cylinders and motors by controlling the flow-rate to these actuators.

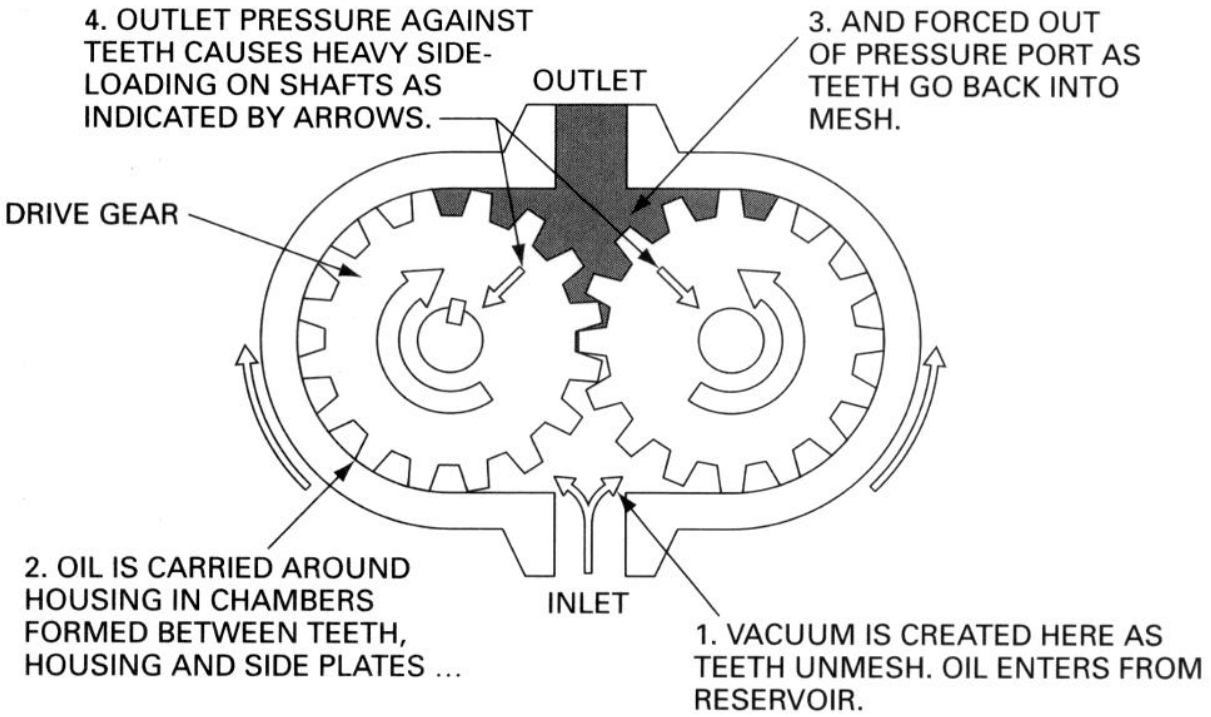
Question two (10 marks)

A) A vane pump is to have a volumetric displacement of 5 cm^3. It has a rotor diameter of 2 cm, a cam ring diameter of 3 cm, and a vane width of 2 cm. What must be the eccentricity?

$$e = \frac{2V_D}{\pi(D_c + D_R)L} = \frac{(2)(5)}{\pi(2+3)(2)} = 0.318 \ cm^3$$

B) Compare between Gear Pump and Radial Piston Pump.

External Gear Pump



External Gear Pump develops Flow by Carrying Fluid between the Teeth of Two Meshing Gears. One of the Gears is connected to a Drive Shaft connected to the Prime Mover. The Second Gear is driven as it meshes with the Driver Gear. Oil Chambers are formed between the Gear Teeth, the Pump Housing, and the Side Wear Plates. The Suction Side is where Teeth come Out of Mesh, and it is here that the Volume Expands, Bringing about A Reduction in Pressure to Below Atmospheric Pressure Fluid is pushed into this Void by Atmospheric Pressure because the Oil Supply Tank is vented to the Atmosphere. The Discharge Side is where Teeth Go into Mesh and it is here that the Volume decreases between Mating Teeth. Since the Pump has a Positive Internal Seal against Leakage, the Oil is Positively Ejected into the Outlet Port.

$$V_D = \frac{\pi}{4}(D_o^2 - D_i^2)L$$

$$Q_T\,(\mathrm{m^3/min}) = V_D\,(\mathrm{m^3/rev}) \times N\,(\mathrm{rev/min})$$

Radial Piston Pump

This Design consists of: A Pintle to Direct Fluid In and Out of the Cylinders, A Cylinder Barrel with Pistons, and A Rotor containing a Reaction Ring. The Pistons Remain in Constant Contact

with the Reaction Ring due to Centrifugal Force and Back Pressure on the Pistons. For Pumping Action, the Reaction Ring is Moved Eccentrically with respect to the Pintle or Shaft Axis. As the Cylinder Barrel Rotates, the Pistons on One Side travel outward. This Draws in Fluid as Each Cylinder passes the Suction Ports of the Pintle.