College of Engineering & Technology

Department: Mechanical Engineering   Marks: 20
Lecturer: Dr. Rola Afify   Time: 8:30 - 10:00
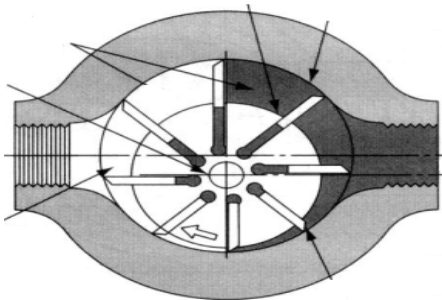Course Code: ME464   Date: 4/5/2016

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

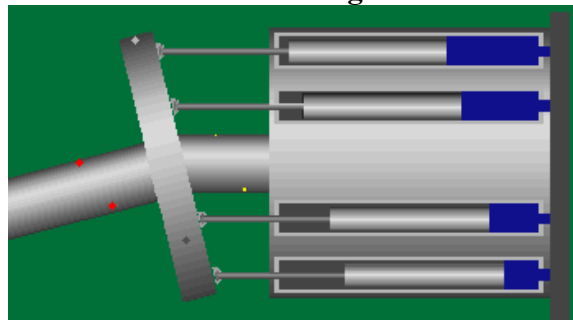**Answer the following questions:**
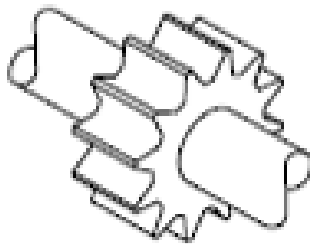## Question one (8 marks)

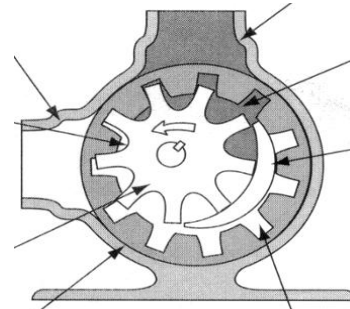**Write down the words that represent the name of each of the following:**

Vane Pump

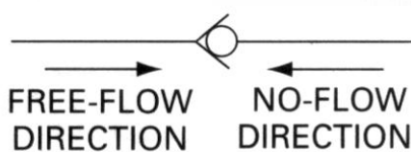Bent-Axis Design Axial Piston Pump

Spur gear

Internal Gear Pump
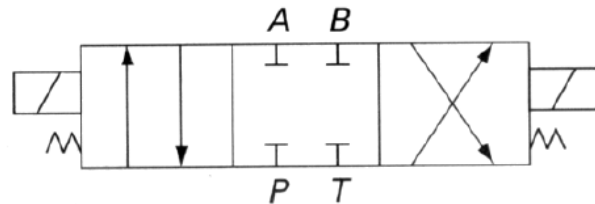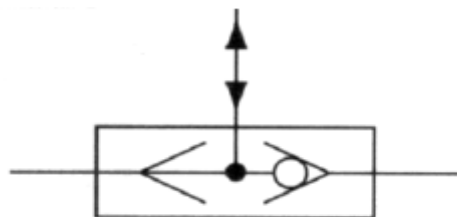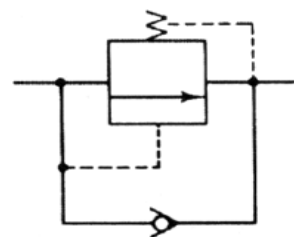
Check valve

Solenoid-Actuated, Three-Position, Spring-Centered, Four-Way, Directional Control Valve

Shuttle Valves

Counterbalance Valves (CBV)

Question two (6 marks)
a) What is the function of:-

Pilot-Operated Check Valve

It permits free flow in one direction but permits flow in the normally blocked opposite direction only if pilot pressure is applied at the pilot pressure port of the valve.

Relief valve

It permits flow through the outlet to the tank as long as this high pressure level is maintained.

Shuttle Valve

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

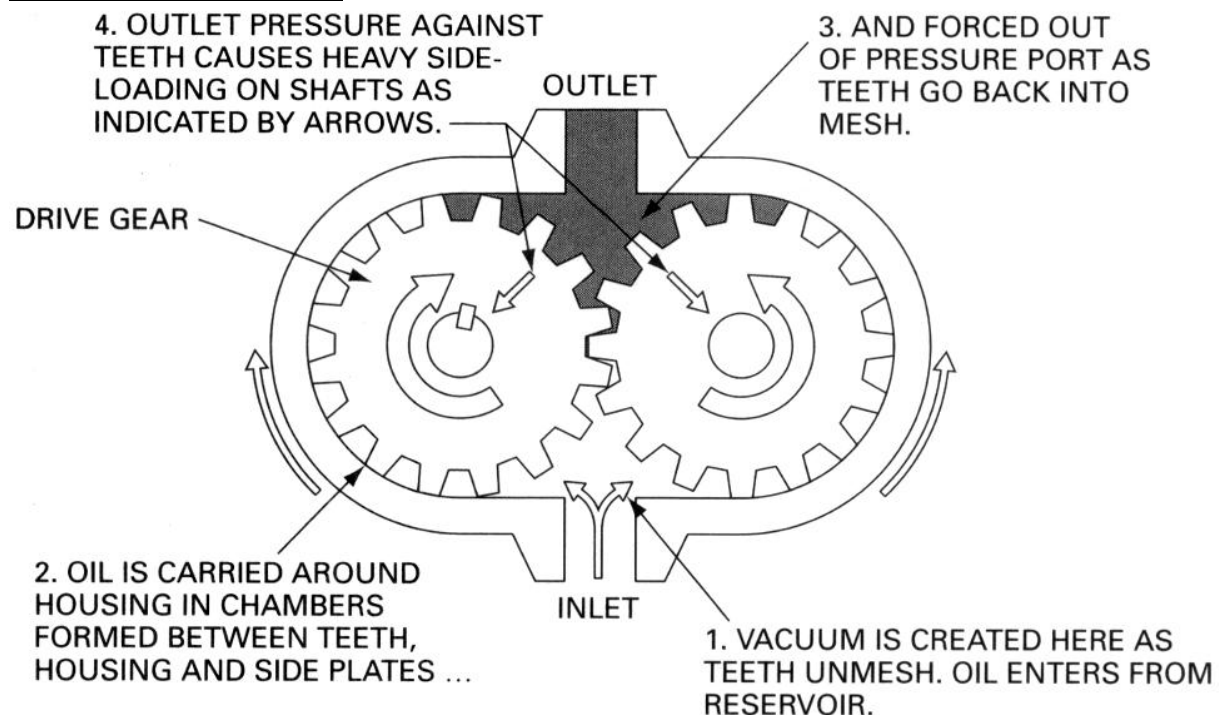**Which of the following valves are used for Flow control?**

Needle valve
Non-Pressure-Compensated Valves
Pressure-Compensated Valves

Question three (6 marks)

Compare between External Gear Pump and Swash Plate Design Axial 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.

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

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

Swash Plate Design Axial Piston Pump
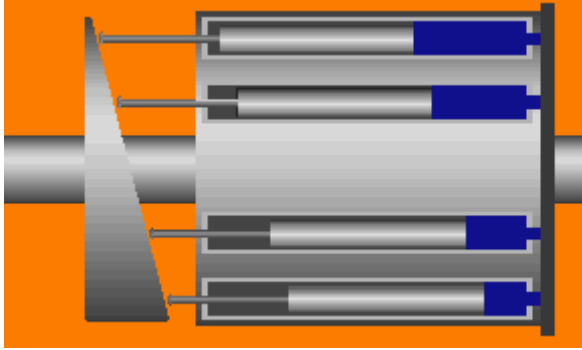
In This Type, the Cylinder Block and Drive Shaft are located on the Same Centerline. The Pistons are connected to a Shoe Plate which bears against an Angled Swash Plate. As the Cylinder Rotates, the Pistons reciprocate because the Piston Shoes follow the Angled Surface of the Swash Plate. The Outlet and Inlet Ports are Located in the Valve Plate so that the Pistons pass the Inlet as they are being Pulled Out and pass the Outlet as they are being Forced Back In.

MAXIMUM SWASH PLATE ANGLE (MAXIMUM DISPLACEMENT) DECREASED SWASH PLATE ANGLE (PARTIAL DISPLACEMENT) ZERO SWASH PLATE ANGLE (ZERO DISPLACEMENT)

Dr. Rola Afify