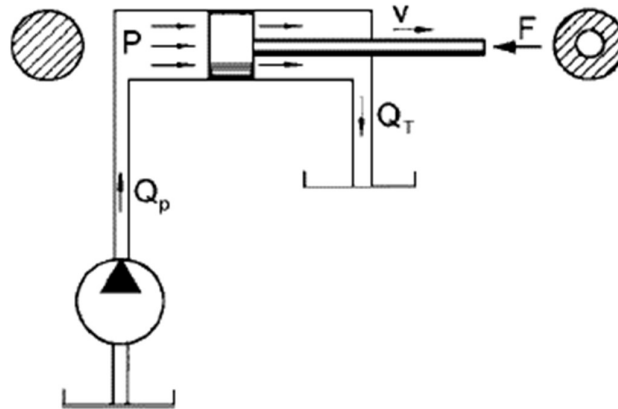


INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

- Q.1 The given figure shows the extension mode of a hydraulic cylinder. Neglecting the losses in the transmission lines and control valves, calculate the loading force (F), returned flow rate (Q_T), piston speed (v), cylinder output mechanical power (N_m), and pump output hydraulic power (N_h). The given parameters are: Delivery line pressure $P = 200$ bar, Pump flow rate $Q_p = 40$ L/min, Piston diameter $D = 100$ mm, Piston rod diameter $d = 70$ mm. CO BL
[5] I 4



- Q.2(a) Discuss the working principle of a Variable Displacement Vane Pump with a suitable sketch. [3] I II
- Q.2(b) State the advantages and disadvantages of hydraulic power systems. [2] I I
- Q.3 Classify the control valves and describe the working principle of a Pressure Reducing Valve with a suitable sketch. [5] II II
- Q.4(a) Write the differences between Pilot Operated Pressure Relief Valve and Direct Operated Pressure Relief Valve. [2] II I
- Q.4(b) A water heater pressure relief valve (PRV) operates at 15 bar. If it is connected to a 20 mm diameter pipe, calculate the cracking force. If the spring constant is 15.7 N/mm, what would be the initial compression to exert the cracking force on the poppet that plug the relief valve? In order to pass full pump flow through the valve at the PRV pressure setting, the poppet must move 0.010 m from its fully closed position. Determine the full pump flow pressure (PRV pressure setting)? [3] II IV
- Q.5(a) Write the differences: [5] III II
- i. Between single-acting cylinder and double-acting cylinder
 - ii. Between Open-loop system and Closed-loop system