

(Following Paper ID and Roll No. to be filled in your Answer Books)

PAPER ID : MJ01

Roll No.

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M. TECH. (Sem.II)

THEORY EXAMINATION 2015-16

PNEUMATIC & HYDRAULIC CONTROL

Time : 3 Hours

Total Marks : 100

1. Attempt any two out of following: [10×2]
- (a) Explain briefly with neat sketch the working of pressure compensated flow control valve used in hydraulic system.
- (b) Explain briefly with neat sketch the construction and operation of compound pressure relief valves.
- (c) An actuator forward speed is controlled by a meter in circuit. The pressure setting of relief valve is 50 bar and pump discharge = 30 liter/min. the cylinder has to carry a load of 3600N during the forward motion. The area of piston is 15 cm² and rod area = 8 cm². The flow of control valve is set to allow only 10 liters/min. calculate the power input to motor, forward speed and return speed and efficiency of the circuit.

2. Attempt any two out of following: [10×2]
- (a) Design and explain the hydraulic power circuit for sequencing of the following operation in a drilling machine.
 - (i) Clamping the work piece
 - (ii) Drilling the work piece
 - (iii) Unclamping the work piece
 - (b) A pressure relief valve has a pressure setting of 69 bars. (a) Compute the hydraulic power loss across this valve if it returns all the flow back to the tank from a $0.0013 \text{ m}^3/\text{sec}$ discharge pump. (b) If unloading valve is used to unload the pump and if the pump discharge pressure during unloading equals 1.72 bars, how much power is being wasted.
 - (c) Explain the working principle of the following along with their symbols.
 - (i) Sequence valves
 - (ii) Counter balance valves
3. Attempt any two out of following: [10×2]
- (a) A double acting cylinder is hooked up in the regenerative circuit. The relief valve setting is 100 bars and pump flow is $0.0016 \text{ m}^3/\text{sec}$. if the regenerative and retracting speed are equal to 0.25 m/s. find the piston and rod area also load carrying capacity for the
 - (i) Extending stroke
 - (ii) Retracting Stroke

(b) Explain with the help of a hydraulics circuit. How the cylinder speed can be controlled by metering in oil from the cylinder.

(c) A hydrostatic transmission operating at 70 bar pressure has the following characteristics for the pump and the motor:

Pump : Capacity of pump, $C_p=82 \text{ cm}^3/\text{rev}$ (pump displacement)

Volumetric efficiency of pump, $\eta_{VP} = 82\%$

Mechanical efficiency of pump, $\eta_{MP} = 88\%$

Speed of pump, $N = 500 \text{ rev/min}$

Motor: Capacity of motor, $C_M = ?$

Volumetric efficiency of motor, $\eta_{VM} = 92\%$

Mechanical efficiency of motor, $\eta_{MM} = 90\%$

Speed of pump, $N = 400 \text{ rev/min}$

Actual Torque, $T_a = ?$

4. Attempt any two out of following: [10×2]

(a) Sketch and explain the basic pneumatic design

(i) Pneumatic applications

(ii) Pump characteristics curves.

(b) Write notes on :

(i) Desirable properties of hydraulic oil

(ii) Problems caused by gases in hydraulic fluids

- (c) A fixed displacement vane pump delivers 1000psi oil to an extending hydraulic cylinder at 20gpm. When the cylinder is fully extended, oil leaks past its piston at a rate of 0.7gpm. The pressure relief valve setting is 1200psi, if a pressure-compensated vane pump were used it would reduce pump flow 20gpm to 0.7gpm when the cylinder is fully extended to provide the leakage flow at the pressure relief valve setting of 1200psi, how much hydraulic horse power would be saved by using the pressure compensated pump?

5. Attempt any two out of following: [10×2]
- (a) Sketch and explain circuit for Air-pilot control double acting cylinder.
- (b) State pascal's law. List five applications of fluid power in the automotive industry.
- (c) Sketch and explain:
- (i) Pneumatic valve
 - (ii) Gravity type accumulator
 - (iii) Spring loaded type accumulator
