

Tables and Charts are allowed

Question No.1

- (A) Write a short notes in: hydraulic oil – pneumatic system – accumulator - Intensifiers
- (B) What is the main factors affecting the performance of hydraulic systems?
- (C) List the different types of hydraulic fluid power which are used in hydraulic motor and the main requirements when selecting one of them?
- (D) A hydraulic pump operates at 2500 psi and discharge 3 gal/min and consumes 5 break hours power to drive the pump. Compute the overall efficiency of the pump. If the pump is driven at 1800 rpm, what is the input torque to the pump?

Question No.2

- (A) Classify the different types of control valves?
- (B) Explain with net sketches the operating principle of cushioning devices?
- (C) A hydraulic cylinder with 2.5 in bore and 1.25 in cylinder rod receives oil at 12 gal/min through 0.75 in Schedule 40 pipe. What is the velocity of the fluid through the return line when the cylinder is retarding?
- (D) The pressure drop across a control valve is observed to be 70 bar. If the fluid has a specific gravity of 0.85 and a flow rate of 12 lit/min. Estimate the rate of heat generated and the temperature rise of the oil as it passes through the control valve if $C_{p, oil} = 1.76 \text{ kJ/kg} \cdot ^\circ\text{C}$.

Question No.3

- (A) Explain with the help of net sketch how can tandem cylinder amplify the force exerted?
- (B) Discuss operating principle with the help of sketch of the hydraulic system used to raise the automobile hoist
- (C) Compute the volumetric efficiency of a hydraulic motor with a displacement of 0.00983 lit/rev turning at 2400 rpm, that is received fluid at the rate of 24.61 lit/min. How much fluid might be return to the reservoir from the case drain if 50% of the loss in volumetric efficiency can be attributed to internal leakage?
- (D) The performance characteristics of a hydraulic motor which is performed at a fluid pressure of 1000 psi. and given by:

Speed rpm	Fluid Power, hp	Torque, lb _f . in	Flow rate, Gal/min
500	1.3333	115.700	2.6667
1000	2.1333	115.625	5.3333
2000	4.0001	112.500	6.9333
3000	5.3333	109.375	10.1333
4000	6.6667	100.001	13.0667
5000	7.4667	87.500	16.0001

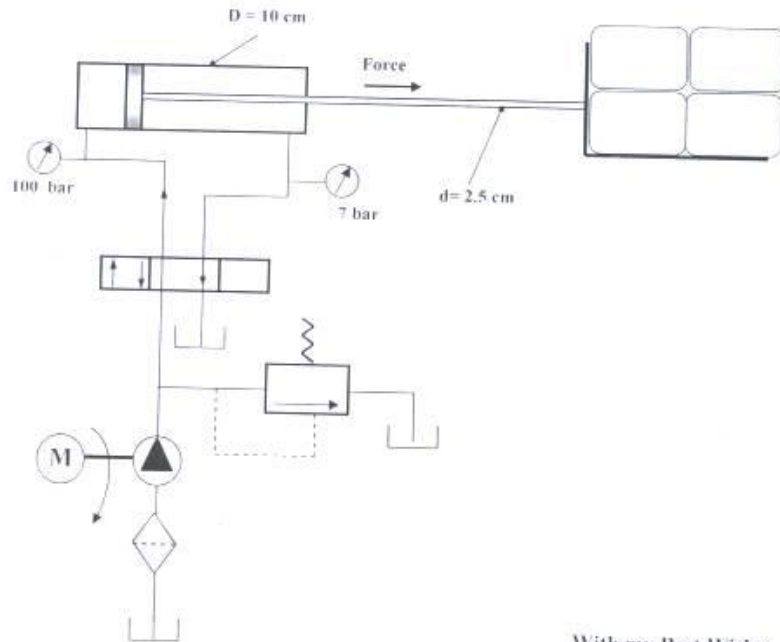
Draw the performance characteristics and find the displacement per each revolution and the brake power if the hydraulic motor speed is 1600 rpm. and $p = 1000 \text{ psi}$.

Question No.4

- (A) Sketch the hydraulic symbol of the following:
Reservoir – four ways valve – strainers and filters – breather – liquid cooler – check valve
- (B) Show with net sketch the function of the temperature-pressure-compensated flow control valve which is used in the hydraulic circuits?

(C) For the hydraulic circuit shown in figure, if the hydraulic oil flow rate is 20 lit/min, find:

- The force exerted
- The velocity of the piston.
- The velocity at inlet and exit of the hydraulic cylinder if the flexible connecting tube is 1.5 cm.



With my Best Wishes
Dr. Gamal Ibrahim Sultan

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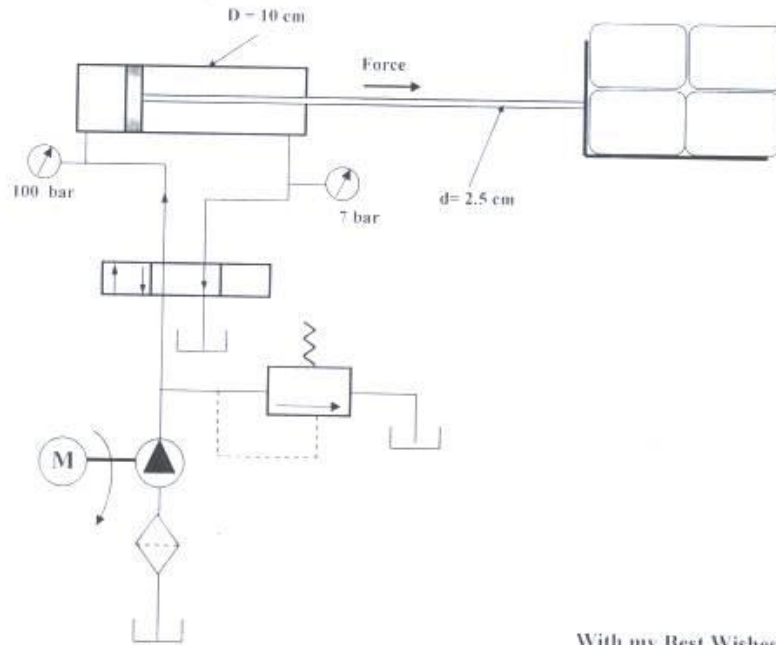
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