Mechatronics Engineering Program / Mechanical Power Engineering Department

Tanta University **Faculty of Engineering**

Course Title	Hydraulic/Pneumatic Systems Design	Academic Year 2024/2025 Fall Term Exam	**Course Code**	MEP331
Year/ Level	**4th Level**			
Date	**14-Jauary - 2025**	No. of Pages (2)	**Allowed time**	**3 hrs**
			Total Assessment Marks: 40	
Remarks: NO REMARKS				

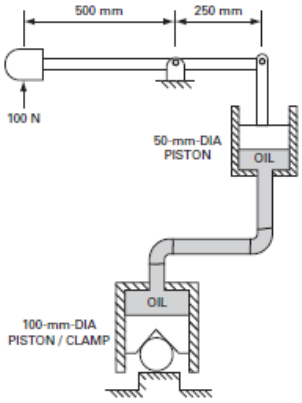
Please, answer the following questions (assume any missing data):-

Question One, (12 Marks):

a) Name and sketch the six basic components required in a hydraulic circuit.
b) List five applications of fluid power in industry.
c) What are the four primary functions of a hydraulic fluid?
d) Draw the hydraulic symbols for the following components: bidirectional hydraulic motors – solenoid-actuated, spring centred, tandem centre, four ways – pressure reducing valve – check valve.

Question Two, (8 Marks):

a) The following Figure shows a mechanical/hydraulic system used for clamping a cylindrical workpiece during a machining operation. If the machine operator applies a 100-N force to the lever as shown, what clamping force is applied to the workpiece?



b) A hydraulic cylinder is to compress a car body down to bale size in 8 s. The operation requires a 3 m stroke and a 40,000-N force. If a 10 MPa pump has been selected, and assuming the cylinder is 100% efficient, find:

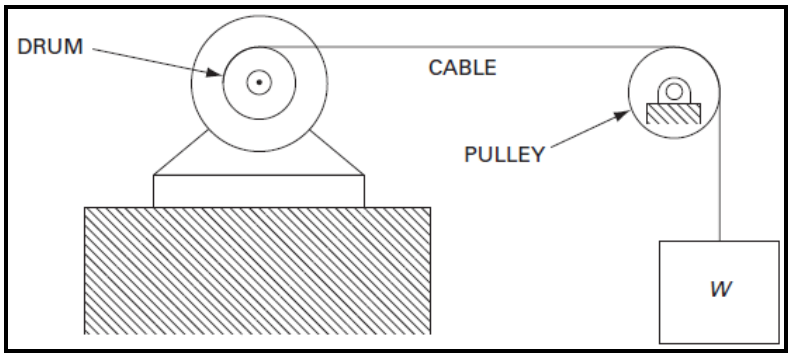
i. The required piston area (m^2)
ii. The necessary pump flow rate (m^3/s)
iii. The hydraulic power (kW) delivered to the cylinder
iv. The output power (kW) delivered by the cylinder to the load

Question Three, (8 Marks):

a) What is the purpose of cushion devices in hydraulic cylinders? Discuss using a neat sketch of the operation principle.
a) The system shown in next Figure, has the following data

pressure = 1×10^5 kPa
weight of load = 4000 N
motor speed = 30 rpm
drum radius = 0.3 m

Determine the flowrate in units of m^3/s and the output power of 100% efficient motor in kW.



Question Four, (12 Marks):

a) Sketch a complete hydraulic circuit shows the function of the meter-out speed control of a hydraulic cylinder. Please, write the names of each component in the sketch.

b) Sequences pressure valves are useful in multiple applications. Sketch a complete hydraulic circuit for the use of these valves in:

i. a circuit that produces continuous reciprocation of a hydraulic cylinder,

ii. controlling the sequence of operations of two double-acting cylinders.

End of questions *Good Luck*

EXAMINERS	***Prof. Dr. Ayman Bakry***	