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VII SEMESTER B.TECH. (MECHATRONICS ENGINEERING) END SEMESTER EXAMINATIONS, DEC 2019 SUBJECT: HYDRAULIC AND PNEUMATIC SYSTEMS [MTE 4103]

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data if any may be suitably assumed
- 05 1A How does an external gear pump differ from an internal gear pump? What types of gears are generally used in gear pumps? Explain.
- What is the advantage of a telescopic cylinder over a standard cylinder? Are **1B** 02 there any disadvantages?
- **1C** A fluid with specific weight 8800 N/m^3 flows at a constant rate through the 03 system. The areas are $A_1=0.002$ m² and $A_2=0.001$ m². The pressures were measured to be $p_1=900$ kPa and $p_2=800$ kPa. Determine the velocity v_1 at the inlet and hence determine the flow rate of this fluid in liters per minute.
- 2A Draw pneumatic circuit to carry out the following operation. Use idle return 04 roller lever valve to eliminate signal overlapping. A+, B+, B-, A-03
- **2B** Explain with relevant sketch how an actuator is slowed down?
- 03 2C Describe the operation with relevant sketches of a pilot-operated solenoid DCV. What is the advantage of these valves over the simple solenoid type?
- 3A A cylinder with a bore diameter of 50 mm and a rod diameter of 20 mm is to be 04 used in a system with a maximum pressure of 15,000 kPa. What are the maximum extension and retraction forces? For this system, what effect would doubling the bore diameter have on the output force generated on extension?
- 03 **3B** With a relevant hydraulic circuit explain how to raise and lower a large weight using a four-way DCV with a tandem neutral.
- **3**C Compare and contrast electrical, mechanical, hydraulic and pneumatic energy 03 media with respect to the following parameters: Energy source, energy storage, energy transmission, linear thrust, noise and controllability.
- 4A Describe the operation of a pilot-operated solenoid DCV. What is the advantage 03 of these valves over the simple solenoid type?
- **4B** Cylinder A (1.0) extends and brings a job under the stamping cylinder B (2.0). 04 Cylinder B then extends and stamps the job. Cylinder A can return back only

after cylinder B has retracted fully. Draw an electro-pneumatic control circuit to be developed for realizing the control task.

- 4C Explain with a neat sketch the working of a separator. 03
- 5A With an example show that accumulator reduces pump requirements in a 04 hydraulic system.
- 5B In a hydraulic press, cylinder must extend quickly under no load then bottoms out and exert full force to the work-piece. A low capacity pump is used to reduce the cost of the system. Develop a suitable circuit without using an accumulator for the given application and explain its working in detail.
- 5C Mention the advantages and disadvantages of an air motor when compared to 02 an electric motor.