



Kafrelsheikh University	 	4 th Year Mechanical
Faculty of Engineering		Final Exam – Jan., 2019
Mechanical Engineering Dept.		Time: 3 hours.
Pneumatic Systems		
<ul style="list-style-type: none"> • Assume any missing or additional data. • Attempt all questions. • Support your answers with neat sketches whenever necessary. 		

Question (1)

Several stations on a rotary machining station shown in *Figure (1)* are driven by a hydraulic power pack. As individual stations are switched on and off, they produce pressure fluctuations throughout the hydraulic circuit. This effect will be studied on six stations; each station includes two actuators for holding and one for processing. The rotation of the rotary table is controlled by a separated actuator. The fluctuations in pressure and the tractive forces created during each station must not affect the feed of the station. A flow control valve is to be used to ensure a smooth adjustable feed rate, while a pressure relief valve is to be used as a counter-holding valve to compensate for the tractive forces for each station. Design and draw the pneumatic circuit of the assembly device to include all requirements using *classic method*. Also include any necessary components for flow and pressure control and position sensors or switches.

Question (2)

For a dispatch station of a LED TV production house shown in *Figure (2)*, design a package lifting device to lift packages containing 21" to 51" LED TVs from the inspection conveyor to the dispatch conveyor. Draw the hydraulic circuit diagram.

- a) Draw the problem positional layout.
- b) Draw the displacement –step (sequence) diagram.
- c) List the components.
- d) Draw the state–time diagrams (displacement, velocity) for each actuator.
- e) Design and draw the pneumatic circuit of the assembly device to include all requirements. Also include any necessary components for flow and pressure control and position sensors or switches.

Question (3)

Pipe sections are frequently required in random lengths and with chamfered ends. The working units at each end of this special machine can be adjusted for different workpiece lengths as shown in *Figure (3)*. The handling system used to insert and remove the workpieces can be of a relatively simple design using pneumatic actuators. In the example shown, the workpieces are taken from a roller conveyor magazine and output to another roller conveyor magazine after machining. The workpieces are clamped during machining; i.e. the tool executes the necessary motion. The feed motion of the slides can be made smoother if a hydraulic cushioning cylinder is connected in parallel with the working motion.

- a) Draw the problem positional layout.
- b) Write the operation, component and specification tables.
- c) Draw the displacement –step (sequence) diagram.

- d) Draw the state-time diagrams (displacement, velocity) for each actuator.
- e) Design and draw the pneumatic circuit of the assembly device to include all requirements. Also include any necessary components for flow and pressure control and position sensors or switches.

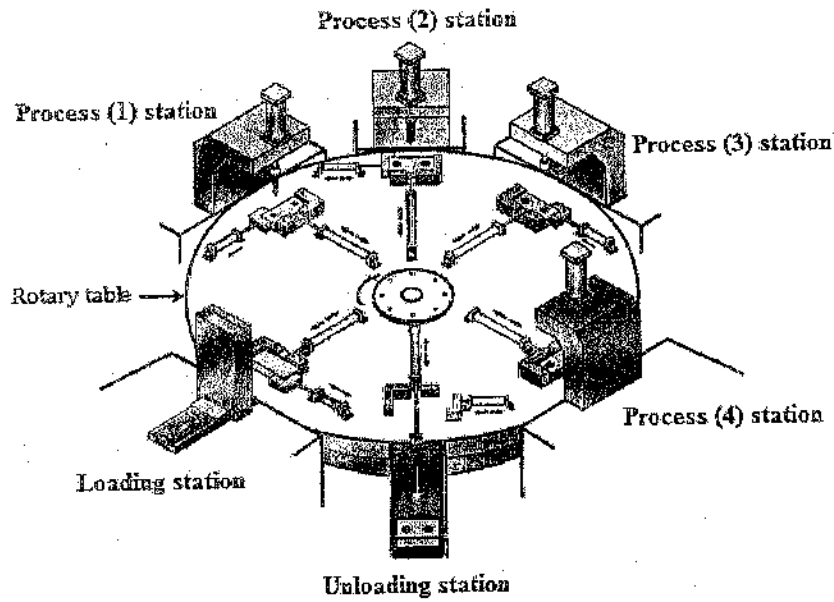


Fig. (1).

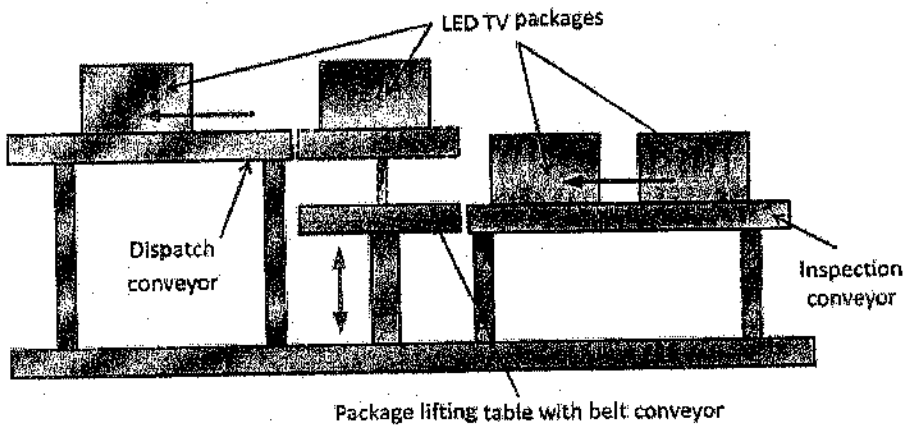


Fig. (2).

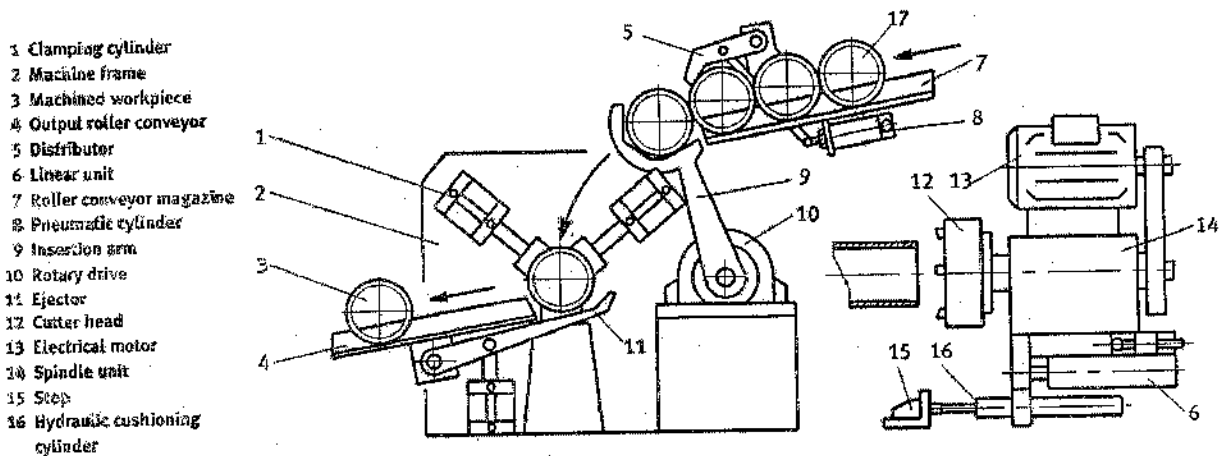


Fig. (3).