Allowed Tables and Charts: None

<u>Answer all the following Questions</u>   **(100 Marks)**

Question (1)   *[30 Marks]*

(a) Explain the main characteristics of the diaphragm compressors.   **(5 Marks)**
(b) Compare between <u>rotary vane</u> and <u>liquid ring</u> compressors. Indicate your answer with neat sketches.   **(10 Marks)**
(c) What does (**RDC**) mean in Pneumatic system? Explain (in points) with neat sketch the main idea of it.   **(10 Marks)**
(d) Lubricator is an urgent component in pneumatic circuit. Discuss why and where it is installed in the circuit. Explain with sketch its operation.   **(5 Marks)**

Question (2)   *[30 Marks]*

(a) How can the actuator speed in a pneumatic system be controlled? Explain your answer with neat sketch on <u>single acting</u> and <u>double acting</u> cylinders.   **(15 Marks)**
(b) A delivery lorry uses a pneumatic braking system. The brakes operate when the driver presses the foot brake. Two single-acting cylinders should outstroke at the same time and press against the wheels. Build up with neat sketch a simple circuit that can be used for such purpose.   **(15 Marks)**

Question (3)   *[40 Marks]*

(a) In a section of a recycling plant, metal cans are dipped in a chemical solution to remove traces of dirt, oil and paint. In order to raise and lower a basket containing the cans, <u>an indirect controlled</u> double-acting cylinder (A in the figure) is to advance when a push button is operated. Upon release of the push button the cylinder is to retract. The cylinder is 250 mm in diameter and consumes a large volume of air. Design and explain (<u>in steps</u>) the circuit diagram for the problem.   **(20 Marks)**
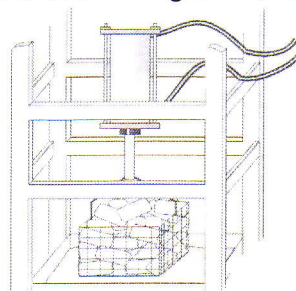
(b) The piston rod of an indirect controlled double-acting cylinder is to advance when a 3/2-way push button valve is actuated manually. The cylinder is to remain advanced until a second valve is actuated. The signal of the second valve can only take effect after the first valve has been released. The cylinder is to then return to the initial position. The cylinder is to remain in the initial position until a new start signal is given. The speed of the cylinder is to be adjustable in both directions.
Design and explain the circuit diagram for the problem.   **(20 Marks)**

Best Wishes
Professor Wageeh El-Askary