

**UNIVERSITY COLLEGE TATI (UCTATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	: DEE 2123
COURSE	: PNEUMATICS AND HYDRAULICS
SEMESTER/SESSION	: 1-2022/2023
DURATION	: 3 HOURS

**Instructions:**

1. This booklet contains 4 questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO**

**THIS BOOKLET CONTAINS 6 PRINTED PAGES INCLUDING COVER PAGE**

PNEUMATICS AND HYDRAULICS (DEE 2123)

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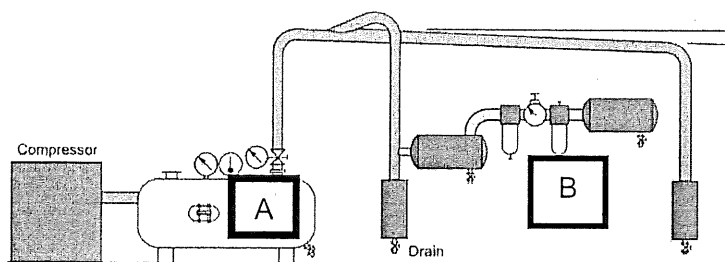
**QUESTION 1**

- a) Describe two (2) advantages and two (2) disadvantages of compressed air. (8 marks)
- b) List two (2) safety requirements to be considered in lab session. (4 marks)
- c) If there is high chance in danger of combustion at working environment, state the most suitable gas to be used in its pneumatic system. (1 mark)
- d) Give two (2) examples of rotary actuator. (2 marks)
- e) List five (5) types of valve. (5 marks)

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**QUESTION 2**

- a) In air generation and distribution system as in Figure 1, there are few components comprised in the system.
- State what is the component labelled with A. (1 mark)
  - State what is the unit labelled with B. (1 mark)
  - State the function of the component labelled with A. (2 marks)
  - List four (4) consideration aspects in the preparation of air service. (8 marks)

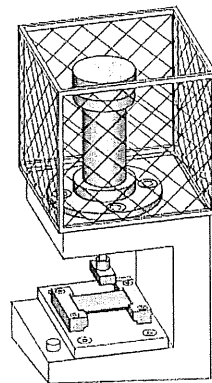
**Figure 1**

- b) Explain the function of directional control valve in terms of:
- Signalling element (2 marks)
  - Processing element (2 marks)
  - Control element (2 marks)
- c) Draw the symbol of 3/2 way pushbutton (NC) with spring return valve. (3 marks)
- d) Draw the symbol of 5/2 way single air pilot with spring return valve. (2 marks)
- e) Describe two (2) common differences between single acting cylinder and double acting cylinder (8 marks)

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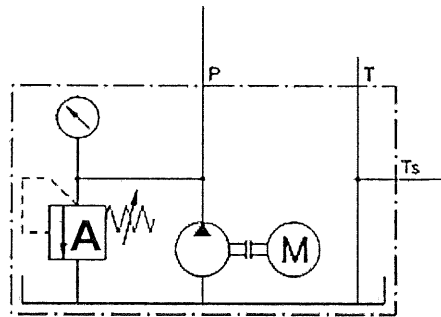
**QUESTION 3**

- a) In pneumatic systematic approach, OR and AND logic function can be represented by special valve.
- Draw the symbol of valve that represents AND logic function (2 marks)
  - Draw the symbol of valve that represents OR logic function (2 marks)
  - Develop a truth table for AND logic function (4 marks)
  - Develop a truth table of OR logic function (4 marks)
- b) For safety reason, an operator needs to press two pushbuttons simultaneously in order to operate a stamping machine as in Figure 2. A double acting cylinder at the stamping machine will extend if both pushbuttons are pressed simultaneously. Cylinder will retract to initial position when either of the pushbutton is released.
- List out all the components used (4 marks)
  - Develop a pneumatic circuit diagram for the problem described (9 marks)

**Figure 2**

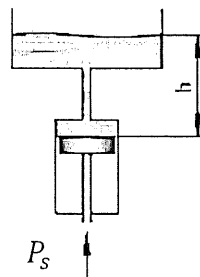
**QUESTION 4**

- a) Define hydrostatic pressure. (2 marks)
  
- b) Figure 3 shows the symbol of hydraulic power pack,
  - i. List all the components assembled in the power pack (5 marks)
  - ii. Explain the function of component labelled A (2 marks)



**Figure 3**

- c) Determine the flow rate,  $Q$  of a pipe that produce 2.7l in 12s. (3 marks)
  
- d) Determine hydrostatic pressure,  $P_s$  for the elevated tank as in Figure 4. The height,  $h$  of the tank is 5m, with density,  $\rho$  is 1000 kg/m<sup>3</sup> and gravity,  $g$  is 10 m/s<sup>2</sup>. State your answer in bar. (5 marks)



**Figure 4**

- e) A cylinder is supplied with 150 bar pressure. Its effective piston area is equal to 700 cm<sup>2</sup>. Determine the maximum force (in  $kN$ ) that can be attained. (3 marks)

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- f) Based on Figure 5, describe the operation of the hydraulic circuit. (4 marks)

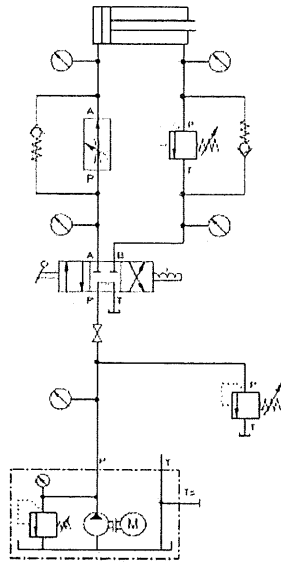


Figure 5

-----END OF QUESTION-----