UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UCTATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DEE 2123
COURSE	: PNEUMATICS AND HYDRAULICS
SEMESTER/SESSION	: 2-2024/2025
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 7 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) List two (2) **advantages** and two (2) **disadvantages** of compressed air. (4 marks)

b) List two (2) safety requirements to be considered in lab session. (2 marks)

c) List three (3) pneumatic system applied in manufacturing. (3 marks)

d) 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)

QUESTION 2

a) In air generation and distribution system as in Figure 1, there are few components comprised in the system.

i. State what is the component labelled with A. (1 mark)

ii. State what is the unit labelled with B. (1 mark)

iii. Describe the function of the component labelled with A. (2 marks)

iv. Describe four (4) consideration aspects in the preparation of air service. (8 marks)

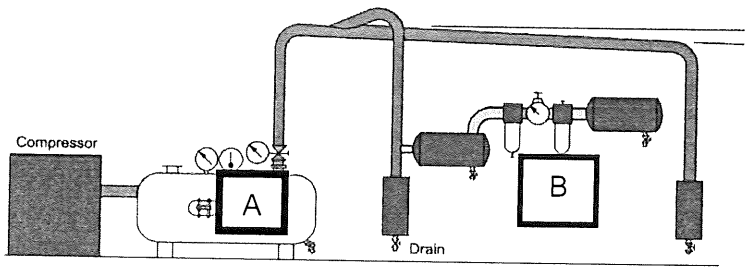

Figure 1

b) Explain the function of directional control valve in terms of:

i. Signalling element (2 marks)

ii. Processing element (2 marks)

iii. Control element (2 marks)

c) Draw the symbol of 3/2 way pushbutton (NC) with spring return valve. (2 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)

QUESTION 3

a) In pneumatic systematic approach, OR and AND logic function can be represented by special valve.

i. Draw the symbol of valve that represents AND logic function (2 marks)

ii. Draw the symbol of valve that represents OR logic function (2 marks)

b) For safety reason, a stamping machine as in Figure 2 will only extend if both pushbuttons are pressed simultaneously. Cylinder will retract to initial position when either one or both pushbuttons is/are released.

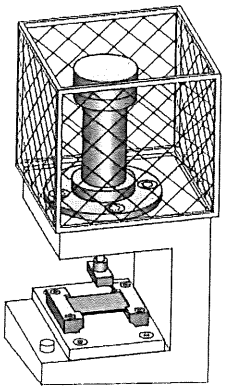

Figure 2

i. List out all the components used. (4 marks)

ii. Develop a pneumatic circuit diagram for the problem described. (9 marks)

iii. Describe the operation of the circuit (3 marks)

QUESTION 4

a) Define hydrostatic pressure. (2 marks)

b) Determine hydrostatic pressure, P_s for the elevated tank as in Figure 3. The height, h of the tank is 12 m, with density, ρ is 1000 kg/m^3 and gravity, g is 10 m/s^2. State your answer in bar. (5 marks)

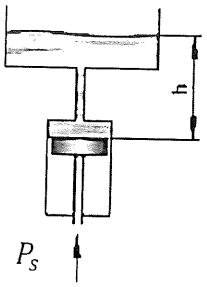

Figure 3

c) Determine the flow rate, Q of a pipe that produce 5.7l in 15s. (3 marks)

d) A cylinder is supplied with 150 bar pressure. Its effective piston area is equal to 0.07 m^2. Determine the maximum force (in $\boldsymbol{kN}$) that can be attained. (3 marks)

e) A vehicle is to be lifted by a hydraulic jack as in Figure 4. Its mass is 1500 kg. The diameter of Piston A, A_A is 0.01 m^2 and the force applied, F_A is 120 N. Determine the area of Piston B, A_B. (7 marks)

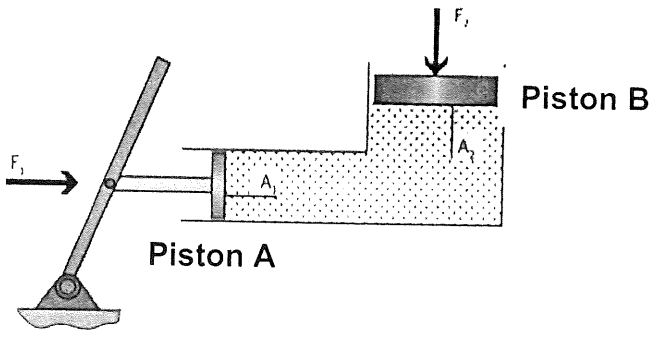

Figure 4

f) Figure 5 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)

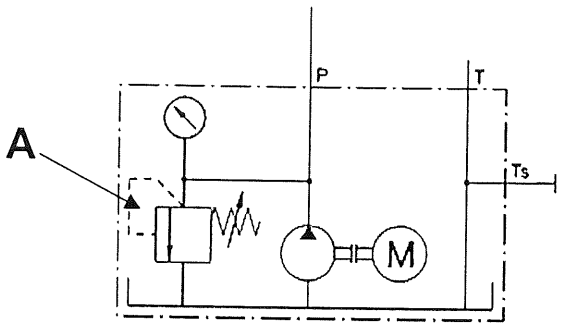

Figure 5

g) Based on Figure 6, describe the operation of the hydraulic circuit. (4 marks)

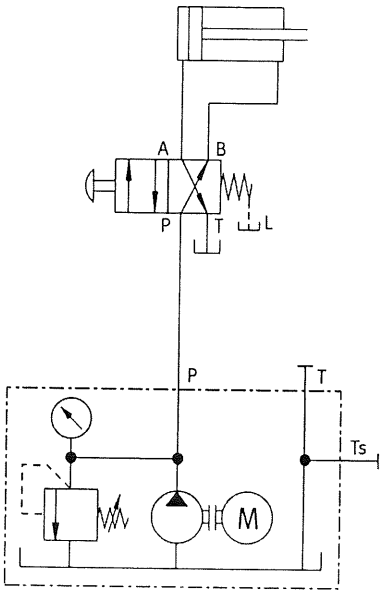

Figure 6

h) Figure 7 shows a floor dumper. It utilizes hydraulic cylinder to operate and stop at any position. Illustrate a hydraulic circuit diagram to perform this operation. (9 marks)

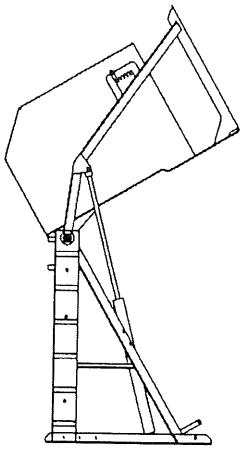

Figure 7

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