UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UCTATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DMT 1053/DEE 2123
COURSE	: PNEUMATIC AND HYDRAULIC
SEMESTER/SESSION	: 2-2022/2023
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 7 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Describe **TWO** (2) advantages of using pneumatic system. (4 marks)

b) List **TWO** (2) industrial application using pneumatic system. (4 marks)

c) Describe (in pie chart) the percentage of physical propertise of air in terms of gas mixture with correct label. (6 marks)

d) List **TWO** (2) safety requirements in pneumatic lab session. (4 marks)

e) State **THREE (3)** physical properties of air. (3 marks)

f) Pneumatics can be considered in two branches. Describe these two branches. (4 marks)

QUESTION 2

a) State a difference between **direct actuation** and **indirect actuation** of a pneumatic circuit.

(2 marks)

b) Shuttle valve can be used to represent the logic circuit in pneumatic:

i) Draw the symbol of shuttle valve (2 marks)

ii) Produce a truth table represented by shuttle valve (4 marks)

c) Describe the operational principle of a time delay valve (NC) (8 marks)

d) For safety reason, an operator needs to press two pushbuttons simultaneously in order to operate a stamping machine as in **Figure 1**. 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. Sketch a pneumatic circuit diagram for the problem description.

(9 marks)

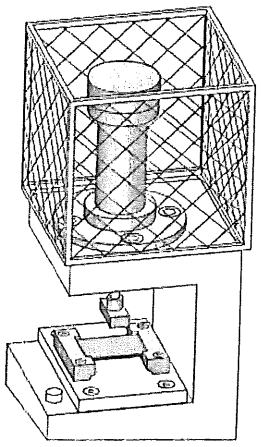

Figure 1

QUESTION 3

a) List five (5) components to convert from electrical to mechanical then to hydraulic energy (5 marks)

b) Figure 2 shows the symbol of hydraulic power pack.

i) List all the components assembled in the power pack (5 marks)

ii) Describe the function of component labelled A (2 marks)

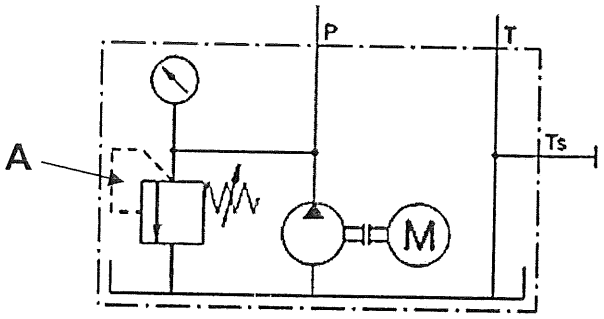

Figure 2

c) By referring to Figure 3, determine the weight of the car in N if the area of the piston A is 600 mm^2, the area of piston B is 10 500 mm^2 and the force applied on piston A is 500 N. (4 marks)

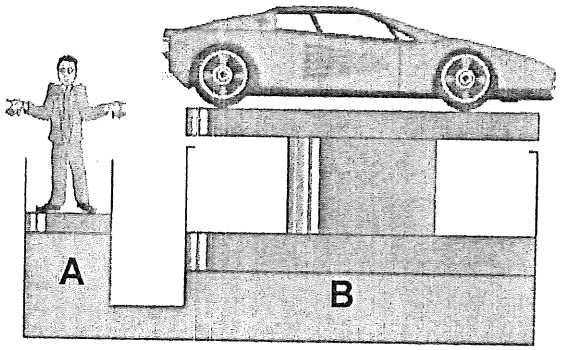

Figure 3

d) A fluid flows at a velocity of 2 m/s through a pipe with diameter of 0.4 m. Determine the flow rate in m^3/s.

(6 marks)

e) A cylinder is supplied with 150 bar pressure. Its effective piston area is equal to 700 cm^2. Determine the maximum force that can be attained.

(3 marks)

QUESTION 4

a) A furnace door as in Figure 4 is to be opened and closed by a double-acting cylinder. The cylinder is activated by a hydraulic valve with spring return. This ensures that the door opens only as long as the valve is actuated. When the valve actuating lever is released, the door closes again. Sketch a hydraulic circuit for this application using 4/2 way valve.

(6 marks)

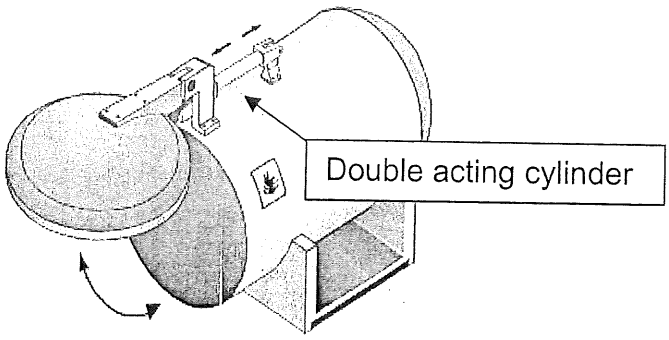

Figure 4

b) When the hydraulic power pack is turned on, the double acting cylinder of a 10-ton ladle tilter can be elevated to the three desired positions as illustrated in Figure 5. The ladle tilter is used to pour the mixing cement to another container after the mixing process is done. The speed of the cylinder also can be controllable. Sketch a hydraulic circuit diagram for the application.

(10 marks)

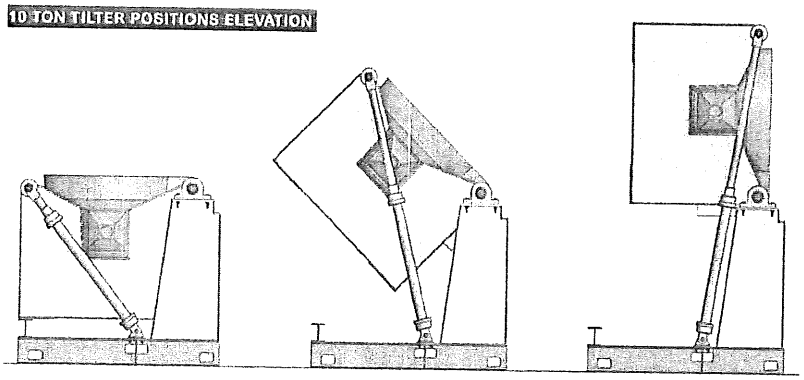

Figure 5

c) List **THREE** (3) sections in hydraulic power section (3 marks)

d) Draw the symbol for:

i) 4/3 way valve with closed mid position (2 marks)

ii) 4/3 way valve with pump recirculation (2 marks)

iii) 4/3 way "H" mid- position (2 marks)

----------End of question----------