

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

COURSE CODE	: BMT 1053
COURSE	: PNEUMATICS 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 9 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

- a) i. Define how air flows from one point to another in pneumatic system. (2 marks)
- ii. Explain six (6) characteristic that effects air flow in pneumatic system. (6 marks)
- b) Explain main function for each component below
- i. Pressure regulator valve (PRV) (2 marks)
 - ii. Check valve (Non-return valve) (2 marks)
 - iii. Two pressure valve (2 marks)
 - iv. Shuttle valve (2 marks)
 - v. 5/2 way double air pilot Valve (2 marks)

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c) Complete the Table 1 by calculating extend and retract forces, if diameters D1 is 1.5 inch and D2 is 0.625 inch. Please refer to Figure 1 and your calculations for each extend and retract forces should be shown.

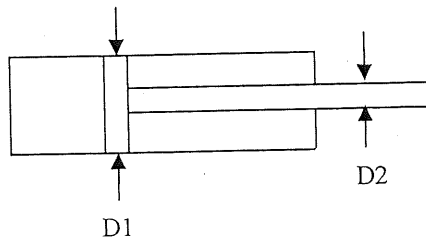


Figure 1

Table 1

Pressure in PSI	Extend Force in lbs	Retract Force in lbs
20 PSI		
40 PSI		
60 PSI		
80 PSI		
100 PSI		

Each calculation step must be indicated:

i. 20 PSI = (2 marks)

ii. 40 PSI = (2 marks)

iii. 60 PSI = (2 marks)

iv. 80 PSI = (2 marks)

v. 100 PSI (2 mark)

QUESTION 2

a) Figure 2 shows the state of the hydraulic fluid as it flows inside, a conductive tube whose shape can cause turbulence of fluid flow, explain a method to reduce this turbulence.

(6 marks)

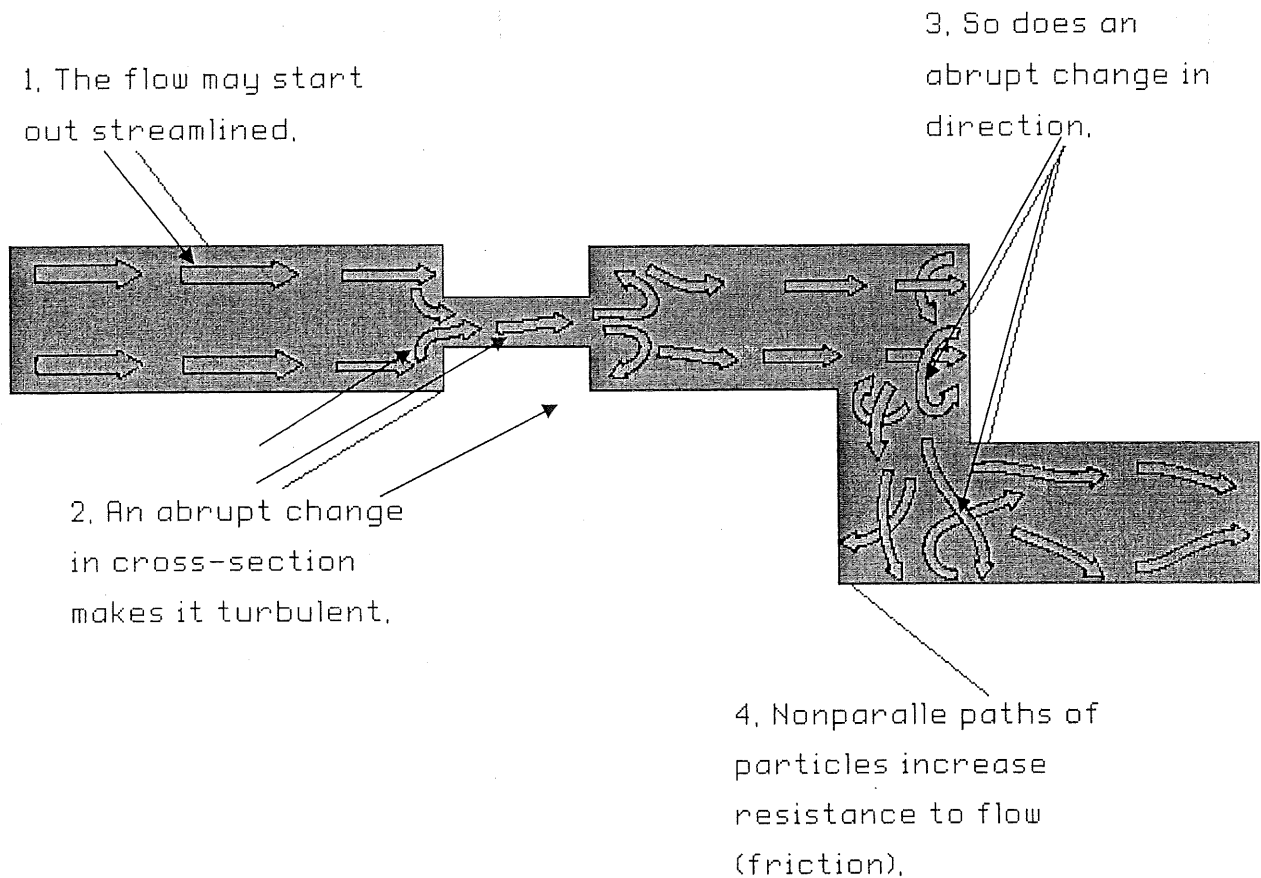


Figure 2

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- b) Explain the use hydraulic pressure and where it comes from, you can use a simple drawing if necessary. (4 marks)
- c) O-ring seals are very important in pneumatic and hydraulic systems, explain how O-ring seals work. (5 marks)
- d) Explain in detail the meaning of atmospheric pressure. (5 marks)

QUESTION 3

a) The piston rod of a double acting cylinder 1 is to extend, when three of 3/2 way pushbutton valves (**PB1 AND PB2 AND PB3**) are actuated and will only retract when the fully extend position of a double acting cylinder is reached, which **detected by a 3/2 way Roller Limit Valve** and after **20 seconds** extension of cylinder 1.

- i. List all the components to be used (4 marks)
- ii. Produce a pneumatic circuit diagram to solve the above problem and label all lettering/numbering for hydraulic/pneumatic system. (12 marks)

b) Figure 3 shows a hydraulic car lifting machine, when the 4/3 way valve is activated to the right the two cylinders (cylinder 1 and cylinder 2) will extend and if the 4/3 way valve is activated to the left, the two cylinders will be retracted, and if the 4/3 way valve is centered position, the two cylinders will stop at any positions. The purpose of using a 4/3 valve neutral at mid position is to allow the machine to stop where the desired position.

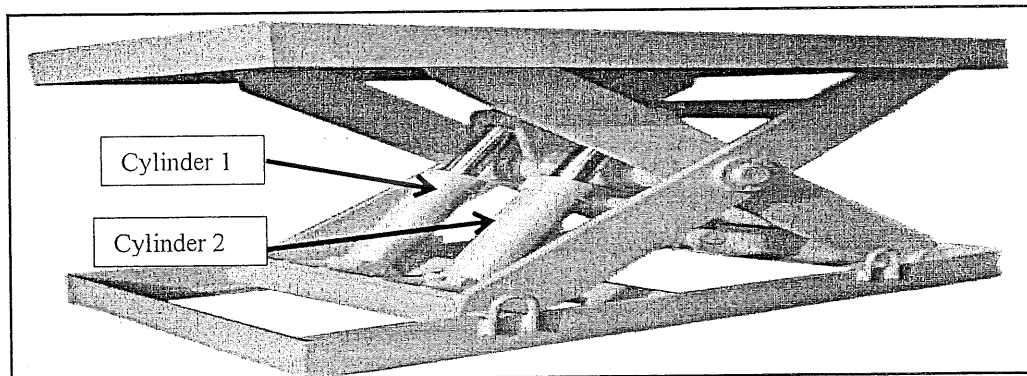


Figure 3

- i. List all the components to be used (4 marks)
- ii. Produce a hydraulic circuit diagram to solve the above problem and label all lettering/numbering for hydraulic/pneumatic system (12 marks)

QUESTION 4

- a) i. Describe the main function of PRV (Pressure Relieve Valve). (2 marks)
- ii. Describe how DCV (Directional Control Valve) work in hydraulic system. (2 marks)
- b) Figure 3 shows a real hydraulic system, according to the figure 4 :

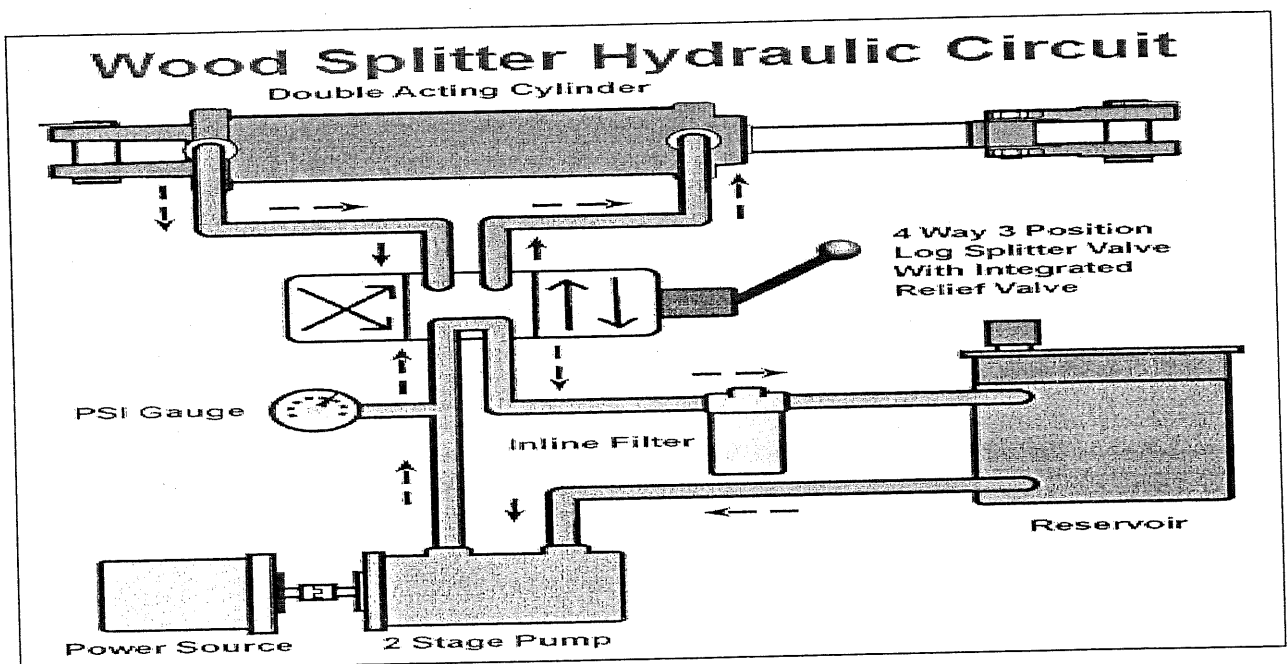


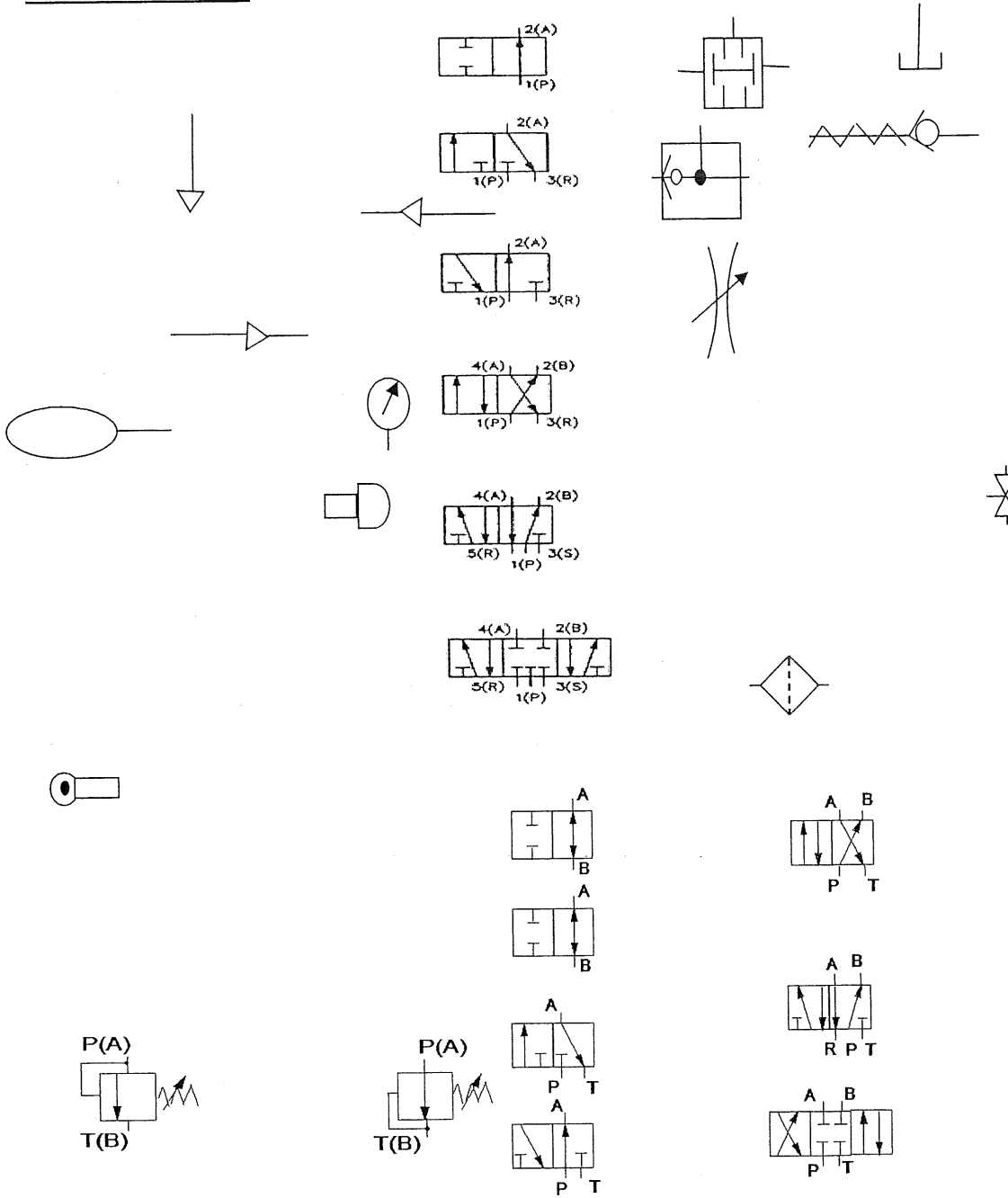
Figure 4

- i. List all the components to be used (4 marks)
- ii. Convert above diagram into a hydraulic circuit diagram and label all lettering/numbering for hydraulic/pneumatic system. (12 marks)

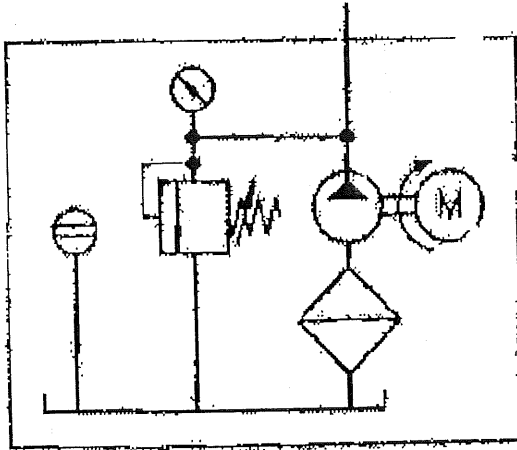
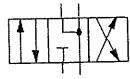
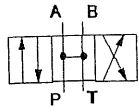
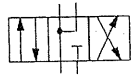
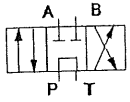
-----End of question-----

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ATTACHMENTS:



PNEUMATICS AND HYDRAULIC (BMT 1053)



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