UNIVERSITY COLLEGE TATI (UCTATI)

| FINAL EXAMINATION QUESTION BOOKLET | |
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| COURSE CODE | : BMT 1053 |
| COURSE | : PNEUMATICS AND HYDRAULIC |
| 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 10 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)

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.

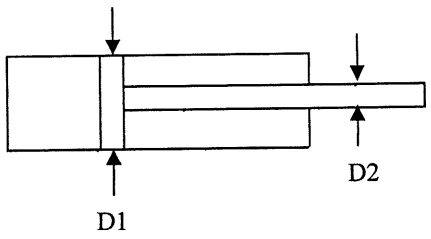



Figure 1

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)

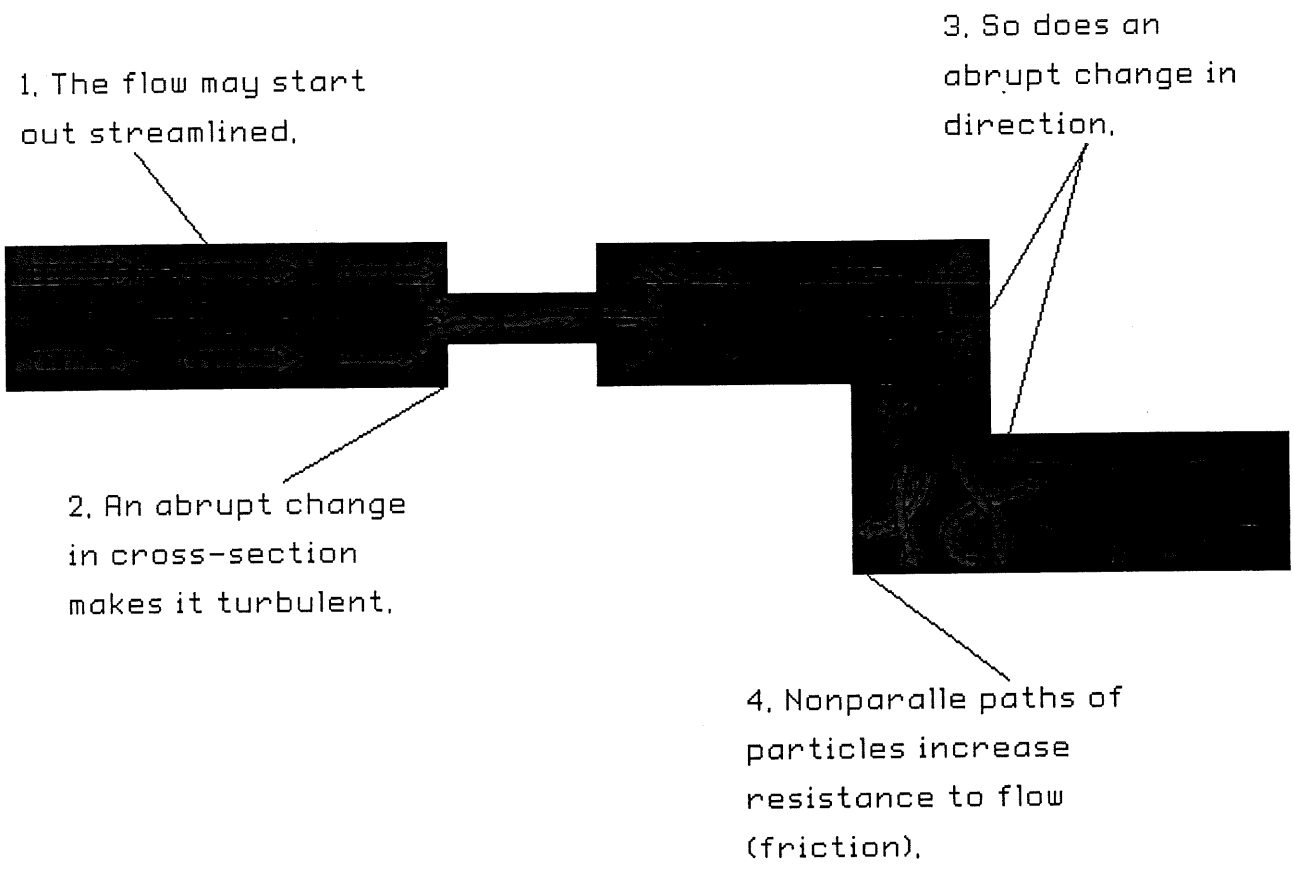



Figure 2

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

(6 marks)

b) Explain about 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) What is meant by atmospheric pressure, explain in detail. ( 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) Draw a diagram of the pneumatic circuit according to the above question requirements. (7 marks)

iii) Explain how the above circuit works. ( 5 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.

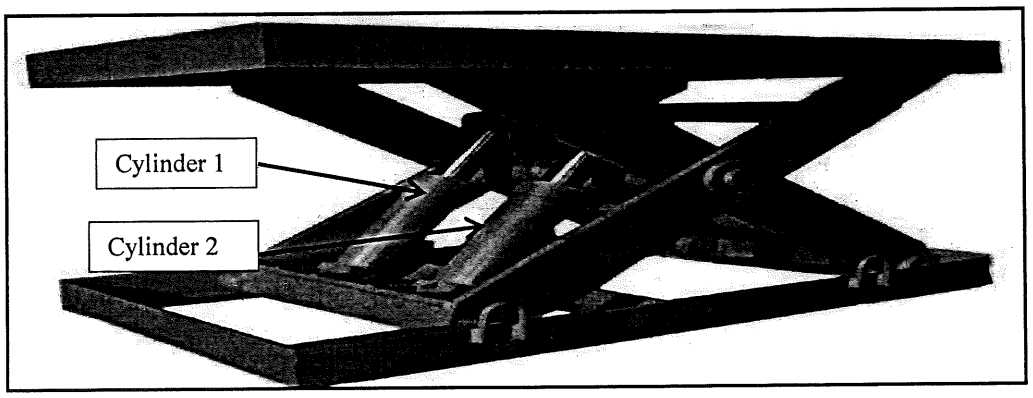



Figure 3

i) List all the components to be used (4 marks)

ii) Draw a diagram of the hydraulic circuit according to the above question requirements. ( 7 marks)

iii) Explain how the above circuit works. ( 5 marks)

## QUESTION 4

a) i) Give 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 4 shows a real hydraulic system, please answer according to the requirements of the questions below :

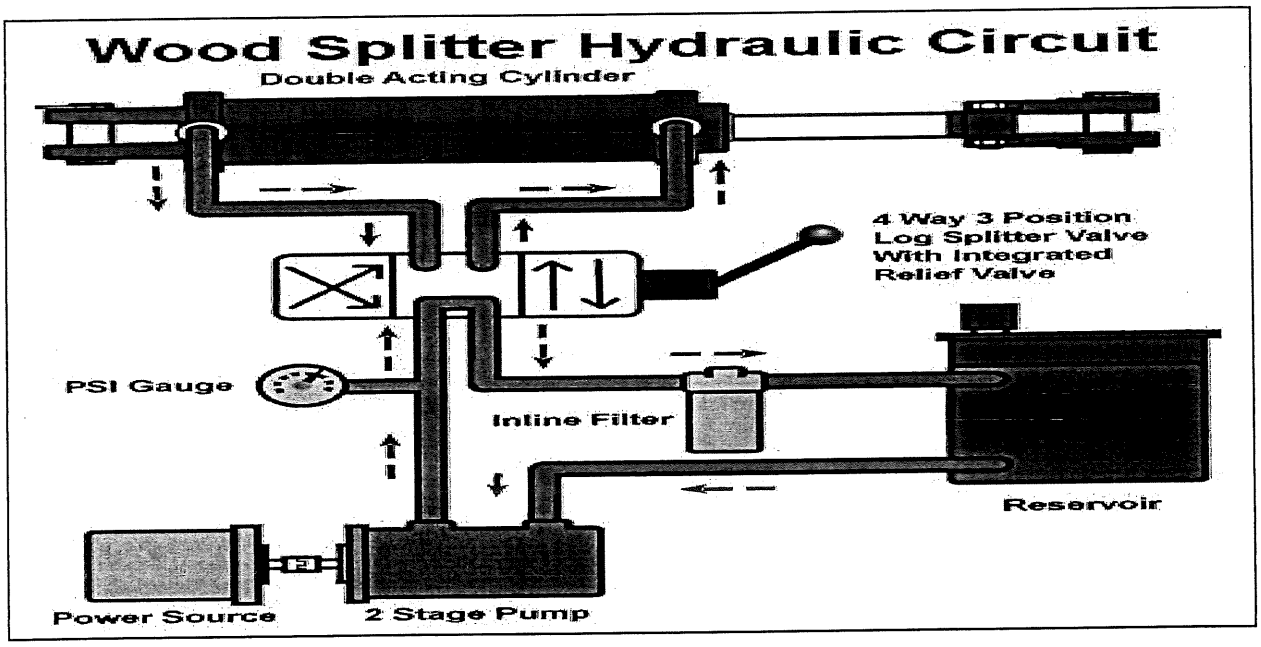



Figure 4

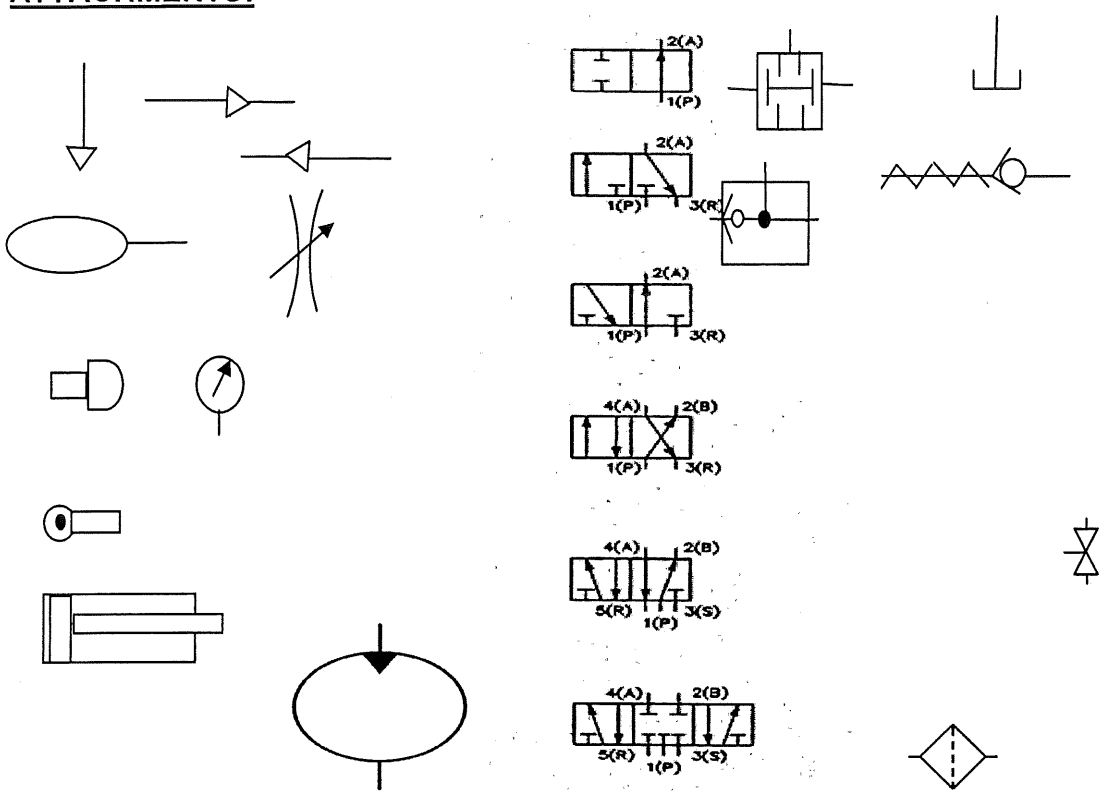
i) List all the components to be used (4 marks)

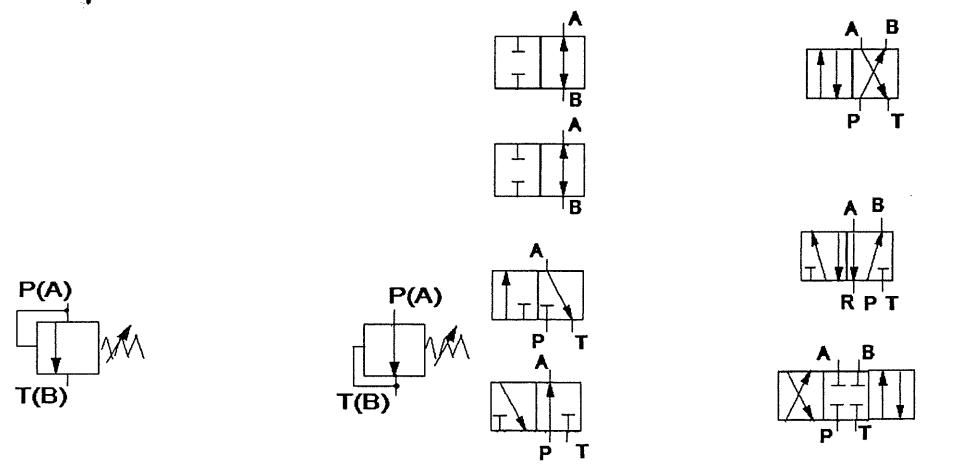
ii) Convert above diagram into a hydraulic circuit diagram and label all lettering/numbering for hydraulic/pneumatic system. ( 7 marks)

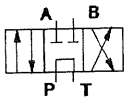
iii) Explain how the above circuit works. ( 5 marks)

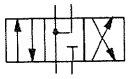
----------End of question----------

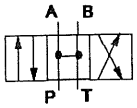
## ATTACHMENTS:

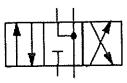


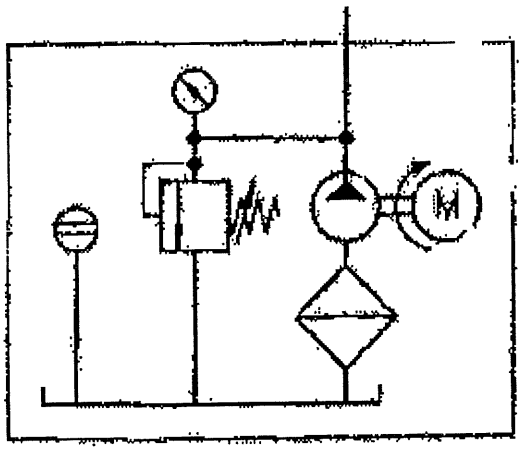







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