Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	FLUID POWER
COURSE CODE	:	BDE 40503
PROGRAMME	:	BDD
EXAMINATION DATE	:	JULY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** FROM SIX (6) QUESTIONS **ONLY**.

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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Q1 (a) Hydraulic and pneumatic power systems are favorable in terms of power-to-weight ratio as compared to mechanical and electrical power systems. However, they also have their cons. Describe the advantages and disadvantages of hydraulic and pneumatic system

(8 marks)

(b) Differentiate the understanding between fluid power and fluid transport system

(4 marks)

(c) Compare the use of fluid power to a mechanical system by listing the advantages and disadvantages of each.

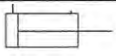
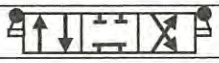
(8 marks)

Q2 (a) Describe the six (6) basic components and functionality that required in hydraulic and pneumatic system.

(12 marks)

(b) Construct the complete working hydraulic circuit that represent the stationary mode and cylinder 1 extends, cylinder 2 does not move using the given equipment symbols as in **Table Q2(b)**.

Table Q2(b)

No.	Description	Symbols
1	Reservoir	
2	Pump	
3	Cylinder	
4	4/3 way valve	
5	Pressure relief valve	

(8 marks)

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Q3 (a) Explain the differences between a fixed displacement pump and a variable displacement pump.

(4 marks)

(b) A gear pump has an 82.6 mm outside diameter, a 57.2 mm inside diameter, and a 25.4 mm width. If the actual pump flow rate at 1800 rpm and rated pressure is 0.00183 m^3/s, calculate the volumetric efficiency

(6 marks)

(c) A pump has a displacement volume of 98.4 cm^3, it delivers 0.0152 m^3/s if oil at 1000 rpm and the pressure is measured about 70 bar. If the prime mover input torque is 124.3 Nm, Determine:

(i) the overall efficiency of the pump

(ii) the theoretical torque that required to operate the pump

(10 marks)

Q4 (a) The pneumatic system as shown in **Figure Q4(a)** is designed to expend and retract the loads using double acting cylinders. The cylinder is free (both ends vented to atmosphere) in the unactuated (spring offset) position of the directional control valves. Redesign the system using the same components to accomplish the following operations:

(i) The cylinder rod moves left when only V1 is actuated,

(ii) The cylinder rod moves right when only V2 is actuated,

(iii) The cylinder rod stops moving when a single actuated valve is unactuated (both valves are unactuated)

(iv) When both valves are actuated, the cylinder is free (both ends are vented to the atmosphere)

(8 marks)

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(b) A pneumatic vacuum lift system uses four (4) suction cups, each having a 90 mm and 70 mm of lip-outside and lip-inside diameter respectively. The vacuum system is to lift large steel sheets weighing 1000 N. The total volume inside the cup cavities and associated pipeline up to the vacuum pump is 0.13 m^3. If a factor of safety of two (2) is used, what flow rate must the vacuum pump deliver if the time required to produce the desired vacuum pressure is 1 min.

(12 marks)

Q5 (a) Maintenance procedures help to sustain hydraulic system performance, efficiency and life. State three simple maintenance procedures.

(6 marks)

(b) Eliminating the pump cavitation in the system is very important. Discuss the corresponding six (6) remedies to overcomes this issues

(6 marks)

(c) Evaluate the environmental issues dealing with developing biodegradable fluids, reducing oil leakage, maintaining and disposal of hydraulic fluids, and reducing noise level

(8 marks)

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Q6 (a) Excessive noise of a hydraulic system is a sign of poor performance. State the remedies for the following cases.

(i) Noisy pump with misaligned coupling;

(ii) Noisy pump due to cavitation problem;

(iii) Relief valve is noisy due to it setting pressure is too low

(6 marks)

(b) Excessive heat of hydraulic systems due to heated working fluid is undesirable. What are the probable causes and what are the corresponding remedies?

(6 marks)

(c) A pressure-reducing valve is set to limit the force exerted by a clamping cylinder. The 40 mm bore cylinder must not exert more than 13 kN to prevent damage to the part being held. At the moment the directional control valve (DCV) is shifted to close cylinder, the supply pressure is 1.9 x 10^4 kPa

(i) What pressure drop must the pressure reducing valve maintain?

(ii) If the flow to the clamp cylinder is 5 x 10^{-4} m^3/s, what orifice coefficient (k) must be developed by the pressure reducing valve?

(8 marks)

- END OF QUESTION –

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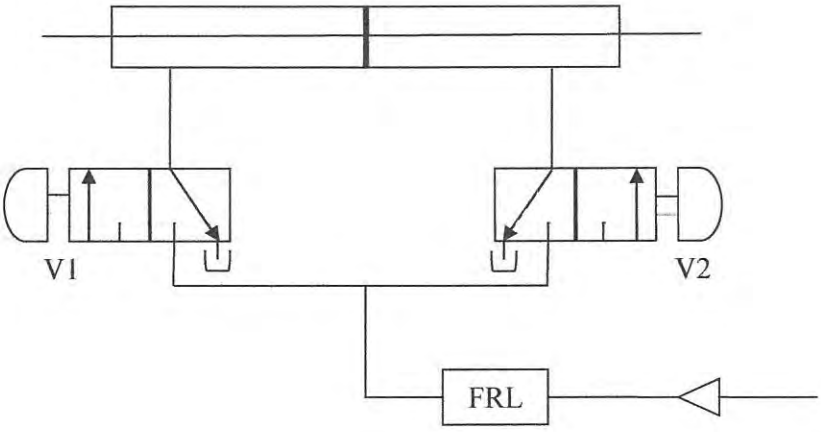

Figure Q4(a)

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