

2112E037

BACHELOR OF VOCATION
Automotive Mechatronics
Subject: Applied Hydraulics and Pneumatics
Subject Code: ABME-202
Semester: Fourth
December 2021
Theory (External): 35 Marks
Time: 03 Hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 1 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 5 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

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===END OF PAPER===
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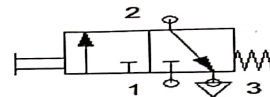
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3. A pump supplies oil at $0.002 \text{ m}^3/\text{s}$ to a 50 mm diameter double acting cylinder and a rod diameter is 20 mm. If the load is 6000N both in extending and retracting stroke, find
 - a. Piston velocity during the extension stroke and retraction stroke
 - b. Pressure during the extension stroke and retraction stroke.
4. A compressor is to be selected in an assembly line for a pick and drop application (maximum allowable pressure upto 40 bar). Explain the selection criteria to be adopted for fulfilling the objective.
5. Categorize the basic properties of hydraulic fluid needed for appropriate functioning of a hydraulic system.
6. Explain AND logic circuits which can be employed in pneumatics system with diagram
7. What is a compressible flow. A pneumatic system is less accurate than a hydraulic system, comment.
8. Consider a simple operation where a double-acting cylinder is used to transfer parts from a magazine in an industry. The cylinder is to be advanced either by operating a push button or by a foot pedal. Once the cylinder is fully advanced, it is to be retracted to its initial position. A 3/2-way roller lever valve is to be used to detect the full extension of the cylinder. Design a pneumatic circuit for the above-mentioned application. The pneumatic components which may be used to implement the mentioned task are as follows:
 - double acting cylinder
 - 3/2 push button valve & 3/2 roller valve
 - shuttle valve & 3/2 foot pedal actuated valve
 - 5/3 pneumatic actuated direction control valve
 - compressed air source and connecting piping

SECTION -A (SHORT/OBJECTIVE TYPE QUESTIONS)
(10x1=10 Marks)

- A. The Discharge of a double acting reciprocating pump is (where L= length of stroke, A=cross-sectional area of piston, and N= speed of crank in r.p.m)-
- L.A.N
 - 2L.A.N
 - (L.A.N)/60
 - (2L.A.N)/60
- B. In which of these pumps, swash plate is replaced by cylinder block:
- Bent axis piston pump
 - Radial piston pump
 - Axial piston pump
 - None of the above
- C. How does cushioning affect the speed of the piston when the cylinder is cushioned at extreme end?
- cushioning decreases, the speed of piston near the extreme ends of the cylinder
 - cushioning increases, the speed of piston near the extreme ends of the cylinder
 - cushioning increases, the speed of piston at the beginning of the stroke in the cylinder
 - cushioning decreases, the speed of piston at the beginning of the stroke in the cylinder
- D. Define the function of directional control valve.
- E. According to Bernoulli's equation for steady ideal fluid flow
- Principle of conservation of mass holds
 - Velocity and pressure are inversely proportional
 - Total energy is constant
 - Pressure head is constant
- F. What is the name of the following ISO symbol?



- Normally open, 3-way, 2 position, push button actuated, spring return
 - Normally closed, 3-way, 2 position, solenoid actuated, spring return
 - Normally closed, 5-way, 2-position, spring return, solenoid actuated
 - Normally open, 5-way, 2-position, spring return, solenoid actuated
- G. Specify any three reasons causing pressure drop in hydraulic systems?
- H. Once the compressed air energy has been converted to mechanical energy, where does the air return to-
- Back to the tank
 - Back to the reservoir
 - Back to the atmosphere
 - None of the above
- I. What are the two advantages of hydraulics over pneumatics
- J. Write two application areas of pneumatic system.

SECTION -B (ESSAY TYPE QUESTIONS)
(5x5=25 Marks)

- Illustrate Pascal's Law w.r.t to hydraulic jack used for lifting passenger cars during puncture of a tyre.
- Differentiate between hydraulic and pneumatic systems. Mention two applications from the shop floor of the industry where hydraulic is employed.