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Question Paper Code : 91957

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2025.

Fourth Semester

Mechanical Engineering

ME 3492 – HYDRAULICS AND PNEUMATICS

(Common to : Mechanical Engineering (Sandwich))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List any two applications of Fluid power in the manufacturing Industry.
2. What do you mean by 'Slip' in pump?
3. Differentiate between a single acting and a double acting hydraulic cylinders.
4. Name various types of pressure control valves.
5. What are the three basic types of accumulators used in hydraulic systems?
6. Draw fluid power symbol for pressure intensifier and gas-loaded type accumulator.
7. What are limit switches? How do they differ from push-button switches?
8. What do you mean by FRL unit?
9. List any four causes for a pump making more noise.
10. List the probable causes for the problem of leakage of compressed air in pneumatic systems.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the working principle of Fixed and Variable displacement pumps.

Or

- (b) What are the types of piston pumps? Explain the working principle of radial piston pumps with neat sketch.

12. (a) Explain in detail about construction and working principle of a simple pressure relief valve with its sectional representation and suitable hydraulic circuit (symbolic representation).

Or

- (b) With a neat sketch, explain the construction and operation of a double acting hydraulic actuator. Also, derive an expression for the torque capacity of the cylinder.

13. (a) Explain the construction and working of hydraulic intensifier with a neat diagram.

Or

- (b) Describe the hydraulic circuit for synchronizing two cylinders with flow control valves.

14. (a) Elaborate on the construction and working of filter, regulator and lubricator in a pneumatic FRL unit with suitable sketches.

Or

- (b) (i) Explain with a neat diagram working principle of quick exhaust valve. (7)

- (ii) Explain the functioning of time dependent control pneumatic circuit. (6)

15. (a) Design and explain the hydraulic power circuit for sequencing of the following operations in a drilling machine:

- (i) Clamping the workpiece, (5)

- (ii) Drilling the workpiece, (4)

- (iii) Unclamping the workpiece (4)

Or

- (b) Device a robot system that can be used for picking and placing glass bottles of a soft drink processing industry with suitable elements.

PART C — (1 × 15 = 15 marks)

16. (a) A hydraulic circuit has been designed to crush a car body into bale size using a 175 mm diameter hydraulic cylinder. The hydraulic cylinder is to extend 2.4 m during a period of 10 s. The time between crushing strokes is 6 min. The accumulator has the following other details:

Gas precharge pressure = 90 bars

Gas charge pressure when pump is turned on = 225 bars

Minimum pressure required to actuate load = 125 bars

- (i) Calculate the required size of the accumulator. (5)
- (ii) What are the pump flow requirements and the pump hydraulic kW power with and without an accumulator? (10)

Or

- (b) Three pneumatic cylinders A, B, C are used in an automatic sequence of operation. A cylinder extend, B cylinders extends, and B cylinder retracts and then A cylinder retracts, C cylinder extends and C cylinder retracts. Develop pneumatic circuit by cascade method. Sketch also the travel step diagram and explain briefly.
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