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Question Paper Code : 53299

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh Semester

Mechanical Engineering

ME 6021 — HYDRAULICS AND PNEUMATICS

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Pascal's law.
2. Laminar or Turbulent flow — Which is preferable for hydraulic circuits? Why?
3. A pump that has a mechanical efficiency of 92% and a displacement of 20 cm³/rev is to be used in a system with a maximum operating pressure of 15 MPa. What is the required drive torque?
4. Sketch the push and pull type gravity return type single acting cylinder.
5. Draw a graphic symbol of 4/3 Regenerative neutral DCV and intensifier.
6. What are the advantages of Air-over-oil circuit?
7. What is air pump and mention its application.
8. What is AND valve? Draw its graphic symbol.
9. What is hydraulic power pack?
10. How to reduce or prevent excessive heating of oil in a hydraulic system?

PART B — (5 × 13 = 65 marks)

11. (a) (i) A hydraulic press has a ram diameter of 20 cm and plunger of 3 cm diameter. It is used for lifting a weight of 30 kN. Find the force required at the plunger. (6)

(ii) List the desirable properties of hydraulic fluid. (7)

Or

(b) How gear pumps are classified? Explain the function of external gear pump. Also show the expression of volumetric displacement and efficiency of the gear pump.

12. (a) (i) A swash plate type axial pump delivers 2 litre/s at 50 rev/s. The pump has nine pistons (diameter of 0.016 m) arranged on a 130 mm piston circle diameter, Find the offset angle. Assume the volumetric efficiency as 95%. (6)

(ii) A hydraulic cylinder is designed by having bore diameter of 63 mm and rod diameter of 25 mm which is used in a system with a 4/3 regenerative neutral DCV and a 45 lpm pump. What are the extension speeds when regenerating and when not regenerating? Also find the total flow rate received by the cylinder during regenerative mode. (7)

Or

(b) Draw a simple sketch and graphic symbol of reservoir and discuss the use of various parts of the reservoir. Also discuss the role of reservoir in hydraulic circuits.

13. (a) In an industry, a vertical type double acting cylinder is used to raise/lower the load. Draw and explain a suitable hydraulic circuit to do the above job without any cylinder creep problem.

Or

(b) (i) What is fail-safe circuit? Develop and discuss the double handed fail safe circuit used for hydraulic press application. (10)

(ii) List the 3 important factors to be considered while designing a hydraulic circuit. (3)

14. (a) Why pressure regulator and lubricator are essentials for pneumatic circuit? Explain the function of these components.

Or

(b) Draw and explain a circuit for control of air cylinder using preferenced Flip-flop.

15. (a) Develop an electro-pneumatic circuit by cascade method for the sequence of A+B-B-A- where A and B are double acting pneumatic cylinders, sign of + and - indicates forward and return stroke of cylinders respectively.

Or

(b) Discuss the following:

(i) Need and benefits of Low cost automation (6)

(ii) Need of PLC in fluid power industry. (7)

PART C — (1 × 15 = 15 marks)

16. (a) (i) A hydrostatic transmission, operating at 72 bar pressure, has the following characteristics:

Pump	Motor
Volumetric displacement (V_D) = 82 cm ³	V_D = ?
Volumetric efficiency (η_V) = 82%	η_V = 92%
Mechanical efficiency (η_m) = 88%	η_m = 90%
Speed (N) = 500 rpm	N = 400 rpm

Find, displacement of the motor (V_D) and motor output torque (T_A). (10)

(ii) What is an accumulator and for what purpose it is added with hydraulic circuits? (5)

Or

(b) Draw and explain a hydraulic circuit to actuate a shaping machine ram. Incorporate the following features in the circuit.

(i) rapid tool approach

(ii) slow cutting operation and

(iii) rapid tool retraction/return.