



B.E. DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2012

MANUFACTURING ENGINEERING

V SEMESTER (R 2004)

MN 375 HYDRAULICS AND PNEUMATICS CONTROL

Time: Three Hours

Maximum Marks: 100

Instructions: Answer all questions

Part -A (10 X 2 = 20 Marks)

- 1 What is fluid power?
- 2 What is the difference between hydraulic pumps and hydraulic motors?
- 3 What is the purpose of regenerative circuit?
- 4 Why is air-over-oil system required?
- 5 What are the considerations for the 'safety of operation' during the design of hydraulic circuits?
- 6 When are proportional control valves preferred in hydraulic circuit design?
- 7 Name two reasons for considering pneumatics instead of hydraulics?
- 8 What is the function of an air filter?
- 9 Nowadays electric control is preferred to manual control of fluid power systems. State the reason for it.
- 10 What is the purpose of providing an indicator lamp wired across each valve solenoid?

Part -B (5 X 16 = 80 Marks)

- 11.a. Explain the working of a gear pump with a diagram. (8)
 - 11.b. A hydraulic cylinder is used to compress cotton bales in 15 seconds. The required stroke is 2.7m and force is 35000 N. If a 7 N/mm^2 pump has been selected, find the required piston area, piston diameter, necessary pump flow and the hydraulic power capacity in kW. (8)
 - 12.a.i. Discuss with a circuit diagram control of a double acting hydraulic cylinder. (8)
 - 12.a.ii. Discuss the double pump hydraulic system with a circuit. (8)
- OR
- 12.b.i. How does a hydraulic motor braking system work? (8)
 - 12.b.ii. How is an accumulator used as a leakage compensator? (8)
 - 13.a.i. A pump supplies oil at $1.667 \times 10^{-3} \text{ m}^3/\text{s}$ to a 60mm diameter double acting hydraulic cylinder. If the load acting during the extending and retracting stroke is 4000N and the diameter of the rod is 30mm, find the following. (8)
 - (1) Hydraulic pressure during the extension stroke
 - (2) The piston velocity during the extension stroke
 - (3) The cylinder capacity in kW during the extension stroke
 - (4) Hydraulic pressure during the retraction stroke
 - (5) The piston velocity during the retraction stroke
 - (6) The cylinder capacity in kW during the retraction stroke
 - 13.a.ii. What are pressure-compensated and non-pressure-compensated valves? Discuss their choice from the design point of view. (8)

OR

- 13.b. Design a hydraulic circuit for the cutting tool movement of a three axis copy milling machine. Discuss in detail with a circuit diagram.
- 14.a.i. Discuss with a neat diagram the working of a screw compressor. (8)
- 14.a.ii. What are the functions of a FRL unit? (8)

OR

- 14.b.i. Discuss the functioning of a hand-lever-operated valve with a diagram. (8)
- 14.b.ii. A double acting cylinder is controlled by air pilot. Draw the circuit and discuss. (8)
- 15.a. What are the seven basic electrical devices commonly used in the control of fluid power systems? Discuss them in detail.

OR

- 15.b. List any six common causes of the breakdown of hydraulic systems. What are the maintenance activities undertaken to reduce or prevent their occurrences?