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B.E./B.Tech (Full-Time) DEGREE END SEMESTER EXAMINATION, APRIL/MAY 2012  
Mechanical Engineering Branch  
FIFTH Semester- REGULATIONS 2008

10

**ME 9303 – HYDRAULICS AND PNEUMATICS**

(Common to Mechanical / Manufacturing Engineering)

Time : Three hours

Maximum : 100 marks.

Answer ALL questions

**Part A – (10 × 2 = 20 marks)**

1. How is the viscosity of hydraulic oil affected by temperature change?
2. Setting of maximum pressure in the system increases, the volumetric efficiency decreases and vice versa – Justify the statement.
3. What is ANSI symbol? Describe the role played by the ANSI in fluid power system.
4. Draw a graphic symbol of 4/3 DCV with float neutral.
5. What is pressure override?
6. Mention two important applications of lubricants in hydraulic system.
7. Name three reasons for considering use of pneumatics instead of hydraulic.
8. What do you mean by ROM and RAM in PLC?
9. What are the factors to be considered while designing a hydraulic circuit?
10. Name the common methods used for designing logic circuits.

**Part B – (5 × 16 = 80 marks)**

- 11.a) i A pump delivers 10 lpm with a pressure rise of 80 bars. The shaft speed is 1420 rev/min and the nominal displacement is  $8 \text{ cm}^3/\text{rev}$ . The torque input is 11.4 Nm. Calculate: volumetric efficiency, shaft power and overall efficiency. (10)
- ii Using suitable diagram and nomenclature, arrive the volumetric displacement equation for a vane pump during normal eccentricity and maximum possible eccentricity conditions. (6)
- 12.a) A vertically mounted double acting cylinder is used to raise/lower the load. What type of problem the cylinder will encounter during its operation. Develop a suitable circuit to prevent such problem and also explain the circuit function.

{Or}

- b) Classify the following hydraulic systems:

- i) Directional control valve
- ii) Positive displacement pump
- iii) Accumulator
- iv) Pressure control valve and Flow control valve

(4 x 4)

- 13.a) It is desired to design a special purpose drilling machine having two cylinders one for clamping (80 mm bore diameter, 20 mm stroke length) and other for drilling (63 mm bore diameter, 120 mm stroke length). The clamping cylinder is to be acting first and then the drilling cylinder. The clamping cylinder load is 600 kg and that for drilling is 500 kg. The requirement of clamping and drilling speed is 1.5 m/min and 200 mm/min respectively. Use standard piston rod for the above bore-size cylinders.

With all of the above information available, work out the specifications of a hydraulic power unit (pump capacity and pressure required during clamping and drilling operation, power needed to drive the electric motor and also size of the reservoir)

(Or)

- b) Why is a pressure relief valve used in a hydraulic system? Using suitable circuits explain the differences between unloading valve and pressure reducing valve.

- 14.a) A double acting cylinder is to carry out an oscillatory motion after a *start* signal is given. The cylinder should stop in the retracted position always when a *stop* signal is given. Develop a pneumatic control circuit to implement the control task.

(Or)

- b) Define a MEMORY function. Draw the circuits of limited memory and unlimited memory and state the differences between them.

- 15.a) A large bore double acting cylinder is to extend and clamp a work-piece when two push button valves are pressed simultaneously. For safety reasons, these push button valves are installed in such a way that both valves cannot be operated with one hand, implying that both hands must be used to operate these two valves. The cylinder is to retract when any one or both push buttons are released. Develop a pneumatic control circuit to implement the control task.

(Or)

- b) What are the electrical components used in fluid power system. At least any four components explain in detail.