Reg. No. : | | | | | | | | | | |

K 6049

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Elective

CAD/CAM

CD 1671 — DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS

(Common to M.E. Engineering Design/M.E. Computer Aided Design and M.E. Computer Integrated Manufacturing)

(Regulation 2005)

Maximum : 100 marks

Time : Three hours

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is wall attachment theory as applied to fluidics?

2. List the six basic components of a hydraulic circuit.

3. What is cracking pressure and pressure over-ride in a relief valve?

4. Draw the pressure discharge characteristics of a gear pump. What are the pressure ratings of gear pump and vane pump?

5. What is cut-in and cut -out pressure for an accumulator?

6. Draw the ANSI symbols for pressure and temperature compensated flow control valve and pressure intensifier.

7. How does a limit switch differ from a push button switch?

8. Draw the ANSI symbol of the valves used for logic functions in pneumatics.

9. What are the different methods available for fluid power circuit design involving more than two cylinders?

10. What is a power pack?

PART B — (5 × 16 = 80 marks)

11. (a) Draw a neat sketch of any one type of variable speed, reversible motor and explain its construction and operation. Also give the ANSI symbol for the same. (16)

Or

(b) (i) Compare the differences between using hydraulic, pneumatic and electrical power systems. (12)

(ii) Can a hydraulic cylinder be designed so that for the same flow, the extending and retracting speeds will be equal? Explain. (4)

12. (a) With the help of sketches differentiate between meter-in, meter-out and bleed off circuit. (16)

Or

(b) (i) Explain the valve with sketch and ANSI symbol, which gives protection of cylinder from freely falling. (6)

(ii) With the help of sketches and ANSI symbols, explain the working of direct acting pressure relief valve and pressure-reducing valve. (10)

13. (a) (i) A double acting hydraulic cylinder is used to press fit a pin to a hole. Design a circuit with a precondition that while actuating, both the hands of the operator should be engaged. (8)

(ii) Draw a hydraulic circuit for automatic to and fro operation of double acting cylinder. (8)

Or

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

(i) Rapid tool approach

(ii) Slow cutting operation

(iii) Rapid tool return. (16)

14. (a) In an industry the following sequence of operation is required $A^+B^+C^-B^-A^-C^+$, where A, B and C represent cylinders, + denotes extension and – retraction of respective cylinders. Design a suitable pneumatic circuit for the above task using cascade method and also sketch travel-step diagram. (16)

Or

(b) (i) Design a circuit using Step-Counter method for the following sequence $A^+B^+A^-B^-$, where A and B represents cylinders and + represents forward motion and – represents the reverse motion. (10)

(ii) Explain the applications of quick exhaust valve and time delay valve with circuits. (6)

15. (a) (i) A hydraulic cylinder is to compress a car body in 8 seconds. The operation requires a stroke of 2.5 m and a force of 45,000 N. If a 8 N/mm^2 pump has been selected, find the following. (1) Required piston area and piston diameter, (2) The necessary pump flow and (3) The hydraulic power capacity in kW. (10)

(ii) Write short notes on Low cost automation. (6)

Or

(b) (i) Explain the working principle of the Programmable Logic Controllers with the block diagram. (10)

(ii) A pump has a displacement of 80,000 m^3. It delivers 100 liters per minute at 1200 rpm and 10 N/mm^2. If the prime mover input torque is 80 Nm, find the overall efficiency of the pump and the theoretical torque required to operate the pump. (6)
