Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(ME)/SEM-1/MME-104/1/2012-13

2012

HYDRAULICS & PNEUMATICS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. 5 × 14 = 70

1. a) Explain working principle of an external gear pump. 4

   b) Explain volumetric displacement and theoretical flow rate of an external gear pump. 4

   c) A gear pump has a 4-in outside diameter, 2-in inside diameter and a 2-in width. If the actual pump flow at 2000 r.p.m. and the actual flow rate is 30 gpm, find out volumetric efficiency of the gear pump. 6

2. a) Explain the purpose of directional control valve. 4

   b) What is the difference between open centre and closed centre type of directional control valve ? Also define the check valve. 4

   c) Explain working principle of various centre flow path for three piston, 4-way valves with neat sketch. 6

3. a) Explain the working principle of a simple pressure relief valve with neat sketch. 4

   b) What is the purpose of a pressure relief valve ? Also define sequence valve. 4

   c) A pressure relief valve contains a poppet of area 0·75 in^2 in which pressure acts. During assembly a spring with a spring constant of 2500 in/lb is installed to hold the poppet against its seat. The adjustment mechanism is then set so that the spring is initially compressed 0·20 in from its free-length condition. In order to pass full pump flow through the valve at the PRV pressure setting, the poppet must move 0·10 in from its full closed position. Determine the following :

      i) Cracking pressure

      ii) Full pump flow pressure (PRV pressure setting). 6

4. a) What is the purpose of a flow control valve ? 2

   b) Write short notes on any *three* of the following : 3 × 4

      i) Pressure reducing valve

      ii) Unloading valve

      iii) Cartridge valves

      iv) Temperature compensated flow control valve.

5. a) Explain the working principles of electro-hydrostatic servo valves with neat sketch. 6

   b) What is rotary actuator ? 4

   c) Explain the application of rotary actuator. 4

6. a) Name the three basic type of accumulators. 4

b) Describe four applications of accumulators. 4

c) A single-vane rotary actuator has the following physical data :

i) Outer radius of rotor = 0·5 in.,

ii) Outer radius of vane = 1·5 in.,

iii) Width of vane = 1·0 in.,

If the torque load is 1000 lb-in., what pressure must be developed to overcome the load ? 6

7. a) What is the purpose of a regenerative circuit ? 4

b) Why is the load carrying capacity of a regenerative cylinder small if its piston rod area is small ? 4

c) Explain working principles of vane pump with neat sketch. 6

8. a) What are moving part logic devices ? 3

b) Name three ways in which moving part logic devices can be actuated. 3

c) Generate the truth table for the function, $Z = A.\overline{B} + \overline{A}.B$.

Draw the logic circuit diagram representing the function using OR, AND and NOT gates. 8