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**B.E / B.Tech( Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013**

**MECHANICAL ENGINEERING**

Fifth Semester

**ME 9303 HYDRAULICS & PNEUMATICS  
(Regulation 2008)**

(Common to Mechanical and Manufacturing Engg)

Time : 3 Hours

Answer ALL Questions

Max. Marks 100

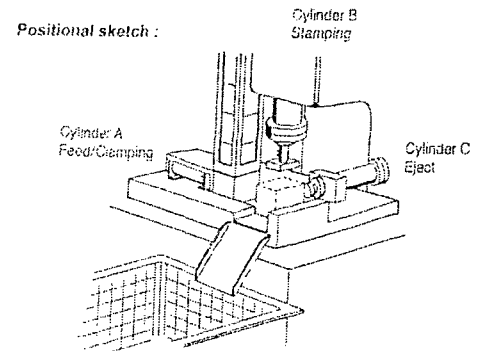
**PART-A (10 x 2 = 20 Marks)**

1. A hydraulic oil flows at a velocity of 1.13 m/sec through a hydraulic pipe of 15 mm diameter. Find the flow rate.
2. Distinguish between filter and strainer.
3. Differentiate between balanced and unbalanced vane pump.
4. List the different types of cylinder mountings and state the situation under which they are selected.
5. Differentiate between single stage and two stage servo valves.
6. Suggest a speed control circuit for a double acting cylinder which controls an overrunning load.
7. What is a quick exhaust valve? state one application.
8. Draw an indirect control circuit of a pneumatic single acting cylinder.
9. What is a counteracting signal and how it is overcome in electropneumatics.
10. What is a scan time in a PLC?

**Part – B ( 5 x 16 = 80 marks)**

11. Design a cascade method of sequential circuit for the following stamping operation.

Rectangular parts are stamped on a special machine. The parts are taken from a gravity-feed magazine, pushed into the machine against a stop and clamped by means of a cylinder A, stamped by a cylinder B and retracts followed by the retraction of Cylinder A The parts are ejected by an ejection cylinder C and retracts. (12)

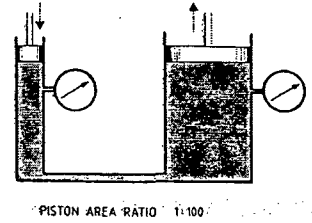


Auxiliary Conditions.

The sequence of operations should be performed automatically, the choice being provided for a single cycle and continuous cycle (2+2)

12. a) (i) List and explain the different properties of hydraulic fluids (8)

(ii) A small piston is connected with a large piston and its arrangement is shown in fig. Calculate the pump stroke, if the piston area ratio is 100:1, the large piston diameter is 150 mm, and the pumping piston must be moved up and down 400 times to lift the large piston a distance of 130 mm (8)



OR

- b) (i) With neat sketches explain the construction principle, operation of a variable displacement swash plate type axial piston pump. Derive an 'expression' for its output. (10)

(ii) A bent axis pump has the following parameters:

number of pistons $z = 9$	piston diameter $d = 9.3$ mm
pitch circle diameter $D = 33$ mm	driving speed $n = 4000$ rpm
inlet pressure $P_i = 0.3$ MPa	exit pressure $P = 18$ MPa
volumetric efficiency = 0.94	total efficiency = 0.89
inclination angle of cylinder block = $20^\circ$	

Calculate the pump theoretical flow, real flow of the pump. (6)

13. a) (i) What is an unloading valve? Explain its use with a circuit. (8)  
 (ii) Classify the direction control valves and explain how centre position of a 4/3 valve is selected. (8)

OR

- b) (i) With neat sketch explain the various parts and their function of a cylinder. (8)

(ii) A double acting cylinder is hooked up to reciprocate. The relief valve setting is 70 bars. The piston area is  $0.016$  m<sup>2</sup> and the rod area is  $0.0045$  m<sup>2</sup>. If the pump flow is  $0.013$  m<sup>3</sup>/s, find the cylinder speed and load carrying capacity during the extension and retraction stroke. (8)

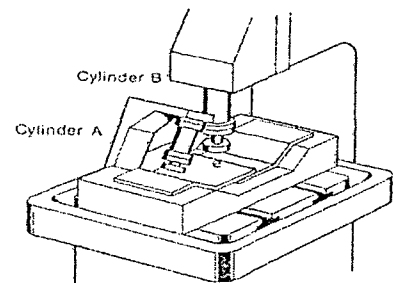
14. a) (i) What are fail safe circuits? Draw and explain two hand safety circuit in detail. (8)  
 (ii) With neat circuits, explain the different methods of synchronization of cylinders. (8)

OR

- b) (i) Design a sequential circuit using the hydraulic sequence valve for the riveting operation.

Sheet metal components are riveted using two hydraulic cylinders. Clamping cylinder A first advance and clamps the sheet metal.

While the parts are clamped a second cylinder B advance and performs the riveting operation. The riveting cylinder retracts and finally clamping cylinder retracts. (8)



(ii) Draw and explain the significance of regenerative circuit in detail.

(8)

15. a) (i) With a block diagram explain the various parts of PLC and with an example explain how relay ladder diagram is converted in to a PLC ladder diagram. (8)

(ii) Draw an electropneumatic ladder diagram for the problem in 14 b) i (8)

**OR**

b) Write short notes on any two of the following:

(2x8=16)

- (i) Hydraulic motors
- (ii) Trouble shooting in pneumatics
- (iii) Fluidics.