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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2012

MECHANICAL ENGINEERING

Fifth Semester

ME 9303 HYDRAULICS & PNEUMATICS
COMMON TO MECHANICAL, MANUFACTURING ENGINEERING

(Regulation 2008)

Time : 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

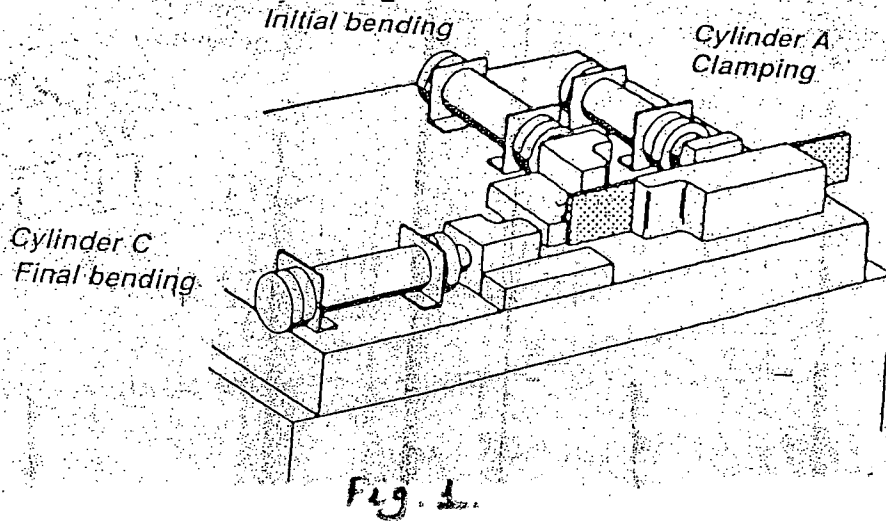
1. Justify the following statement as true or false with adequate reason
"Pneumatic systems are preferred over hydraulics for heavy duty automation application"
2. Distinguish between fire point and flash point of hydraulic fluids.
3. Distinguish between positive and Non-positive displacement pumps.
4. Suggest suitable cylinders for following special application:
 - (i) Double acting cylinders which provides equal velocity on forward and return direction
 - (ii) Cylinders which provides large stroke length.
 - (iii) Cylinders which prevents rotation of piston rod about its own axis.
 - (iv) Single acting cylinders which are used for heavy impact load duty application.
5. Differentiate between servo and proportional control valves.
6. Differentiate between regenerative and intensifier circuit.
7. What are the functions of Filter, Regulator and Lubrication in an FRL unit?
8. Draw a pneumatic 'AND' and 'OR' logic circuits with the help of two 3/2 valves.
9. What is a travel step diagram and draw the same for the sequence A*B*B'A'.
10. What is a latch circuit in an electropneumatic circuit?

Part – B (5 x 16 = 80 marks)

11. Design a cascade method of pneumatic sequential circuit for the following sheet metal bending operation. (Fig. 1)

The sheet metal is inserted by hand. When the start button is pressed, cylinder A clamps the work piece and cylinder B bends the work piece forward and then retracts. Cylinder C completes the bending of the work piece. After cylinder C has returned to its rear end position, cylinder A releases the work piece. (12)

Parameters: Cylinders B and C should advance only after a preset clamping pressure (say 5 bar) is ensured in Cylinder, A. (2+2)



12. a) (i) Differentiate between hydraulics and pneumatics. (4)
- (ii) List and explain the different properties of hydraulic fluids. (6)
- (iii) (ii) A swash plate type axial piston pump has its plunger pitch circle diameter as 250mm and plunger diameter as 20mm, angle of inclination as 20° and the number of pistons as 9. The pump is driven at 1440 rpm and its volumetric efficiency is 99%. Calculate the actual delivery of the pump. If the pump has to pump against 150 bar and the over all efficiency is 0.85. Calculate the power of the prime mover required to drive the pump. (6)

OR

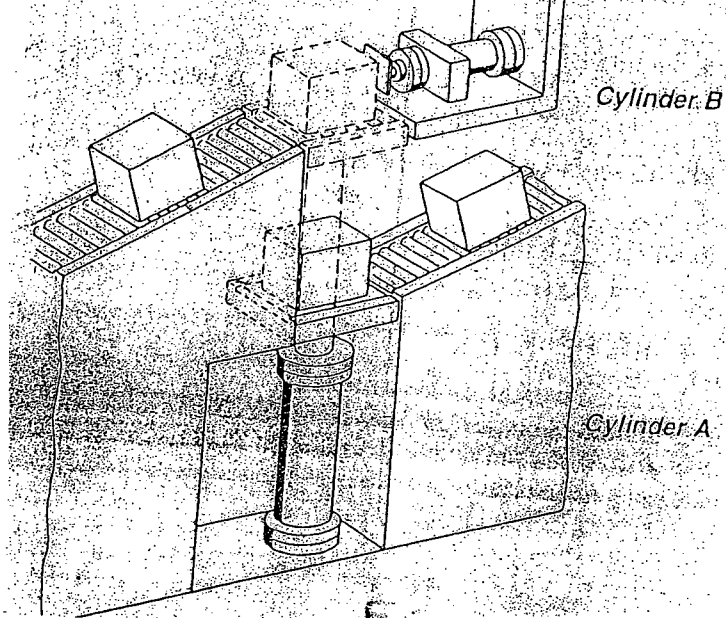
- b) (i) With neat sketches explain the construction principle, operation of a variable displacement Vane pump. Derive an 'expression' for its output. (10)
- (ii) A hydraulic motor has a displacement of 300 cubic cm and a speed of 400 rpm with a pressure drop 200 bar. The volumetric efficiency is 95% and the mechanical efficiency is 90%. Determine actual discharge, Torque and Power. (6)
13. a) (i) Classify the pressure control valves and explain in detail the principle and operation of a compound pressure relief valve. (10)
- (ii) Explain in detail how directive control valves are specified. (6)

OR

- b) (i) With neat sketches explain the working of a two accumulators. (5)
- (ii) What is an intensifier and draw and explain the usage of its with a circuit. (5)
- (iii) A hydraulic cylinder has a bore of 150mm and a piston diameter of 80mm. The extension speed of the cylinder is 5m/min. and maximum pressure applied to the cylinder is 100 bar. Calculate (i) supply flow rate (ii) the extent thrust (iii) the power. (6)
14. a) (i) What is a Hi-Lo circuit? Draw and explain it in detail. (8)
- (ii) What is a Regenerative circuit? Explain it in detail. (8)

OR

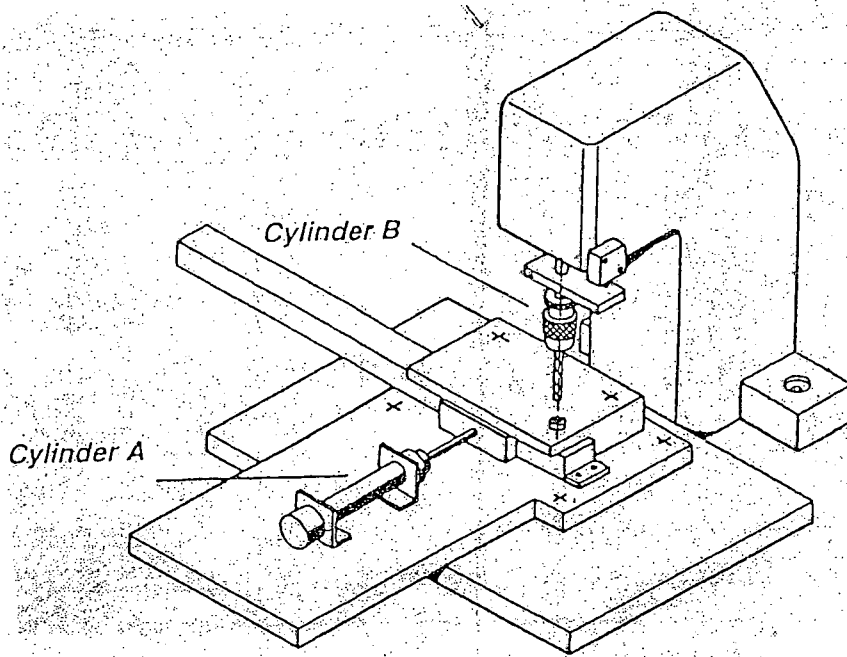
- b) (i) Design a sequential circuit using the hydraulic sequence valve for the following operation. (Fig. 2)
- "Packages arrive on a roller conveyor and are lifted by cylinder A. Cylinder B pushes the packages on to the second roller conveyor. Conveyor B must not retract until cylinder A has reached its rearmost end piston. (8)



(ii) What is the significance of synchronizing circuit and draw and explain any two. (8)

15. a) (i) What is a PLC? Draw and explain the various parts of PLC. (8)

(ii) Draw an electropneumatic ladder diagram for the following problem: "Clamping of a work piece must be possible by hand from two points. The drilling spindle must be retracted when it reaches its front end position." (8)



OR

b) Write short notes on any two of the following: (16)

- (i) Air motor
- (ii) Trouble shooting of actuators
- (iii) Flip flap