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Question Paper Code : C 1381

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2010.

Fifth Semester

Mechanical Engineering

ME 1305 — APPLIED HYDRAULICS AND PNEUMATICS

(Common to sixth semester Mechatronics Engineering)

(Regulation 2004)

(Common to B.E. Part-Time (Fourth Semester) Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give any two differences between hydraulic power and pneumatic power.
2. Give the expression used to determine friction factor for laminar flow through pipes.
3. Sketch the graphical symbol of (a) Variable displacement reversible pump
(b) Telescoping cylinder.
4. What is pressure compensated flow control? How a variable vane pump can provide this feature?
5. Draw a neat sketch of the graphical symbol for 3 position 4 way solenoid energised pilot operated tandem centre direction control valve.
6. List any four applications of accumulators.
7. Sketch the graphical symbol of pneumatic regulator.
8. Draw any one type of cylinder synchronizing circuit.
9. How does a servo valve differ from proportional valve?
10. List the components associated with PLC systems.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the essential and desirable properties of a hydraulic fluid? Discuss. (10)
- (ii) List the precautions to be taken when a mineral oil based fluid is changed into fire resistant fluid. (6)

Or

- (b) (i) Explain how Bernoulli's equation can be used to determine the pressure drop between two stations in a hydraulic system. Assume that there are some number of bends, tees, elbows, globe and gate valves in between these two station separated by a long distance. (10)
- (ii) Oil with specific gravity 0.9 enters a tee, as shown in Fig. 1, with velocity $v_1 = 5$ m/s. The diameter at section 1 is 10 cm, the diameter at section 2 is 7 cm and the diameter at section 3 is 6 cm. If equal flow rates are to occur at sections 2 and 3, find V_2 and V_3 is m/s. (6)

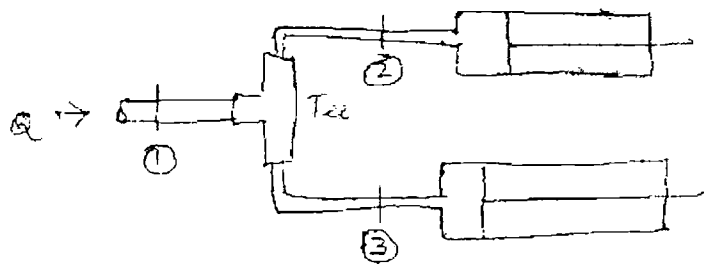


Fig. 1

12. (a) (i) Explain how positive displacement pumps build pressure compared to rotodynamic pumps. What are the advantages of positive displacement pumps? (6)
- (ii) Using a neat sketch explain the construction and operation of an axial piston pump of swash plate type. (10)

Or

- (b) Explain using a neat sketch "end cushioning" provided in hydraulic cylinders. Also sketch atleast six types of cylinder mounts available. (16)
13. (a) Develop a circuit involving two double acting cylinders A and B operating with the following sequence : $A^+B^+B^-A^-$ where + represents extension of rod and - represents retraction. Use only sequence valves to obtain the sequencing. (16)

Or

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- (b) (i) Consider the charging and discharging of a hydro pneumatic accumulator to be isothermal and explain the procedure to arrive at the size of accumulator. (6)
- (ii) Draw a circuit employing accumulator for supplying emergency hydraulic power. (10)
- 14. (a) (i) Explain how the size of the air receiver and pressure drop in pneumatic pipelines (schedule 40) are determined. (6)
- (ii) Using a neat sketch explain the construction and working of a pneumatic regulator. Also give its graphical symbol. (10)

Or

- (b) A double acting pneumatic cylinder is required to provide the following operation : Fast extension till the mid stroke, slow extension till the end of stroke and on sensing the stroke end provide rapid return. Develop a pneumatic circuit employing a shuttle valve and suitable flow control and other valves. (16)
- 15. (a) Draw a neat sketch of an electro hydraulic servo valve and indicate all the components and give their functions. Also develop the transfer function for the open loop gain for this valve. (16)

Or

- (b) (i) Explain various locations at which filters and strainers are fitted giving reasons. (8)
- (ii) If a hydraulic circuit has pump inlet and exit ports interchanged, unloading valve given internal pilot. What happens? Explain. (8)