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Question Paper Code : 91658

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Mechanical Engineering

ME 2305/ME 55/ME 1305/080120027/10122 ME 506 — APPLIED HYDRAULICS AND PNEUMATICS

(Common to Mechatronics Engineering and Mechanical and Automation Engineering)

(Also common to 080120027 – Hydraulics and Pneumatics Systems)

(Regulation 2008/2010)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   List any four advantages of fluid power.

2.   Sketch the ANSI symbols of 4/2 solenoid operated spring return valve and adjustable flow control valve.

3.   'Gear pumps are positive displacement pumps' – Justify.

4.   Sketch a tandem cylinder and list its significance.

5.   State the significance of a shuttle valve.

6.   What are relays?

7.   Mention the significance of compressor starting unloader control.

8.   Sketch a circuit for synchronous movement of two cylinders.

9.   List any four differences between proportional and servo valves.

10. What are the advantages of fluidic elements?

PART B — (5 × 16 = 80 marks)

11. (a) Write short notes on the significance of the following properties of hydraulic oil

    (i)   Viscosity   (4)

    (ii) Oxidation stability   (4)

    (iii) Demulsibility   (4)

    (iv) Neutralisation number.   (4)

Or

(b) The system shown in Fig. Q. 11(b) contains a hydraulic pump delivering high pressure oil of specific gravity 0.9 and kinematic viscosity $1.25 \times 10^{-4} \, m^2/s$, to a hydraulic motor. A 15 m pipe of internal diameter 25 mm and thickness of 5 mm connects the pump and motor. The pipe has two elbow fittings ($k = 0.75$) and one check valve ($k = 4.0$). The motor is placed 6 m above the pump. The pressure required to drive the loaded motor is 34 bar. Determine the pump discharge pressure, if the discharge from the pump is 150 lpm.
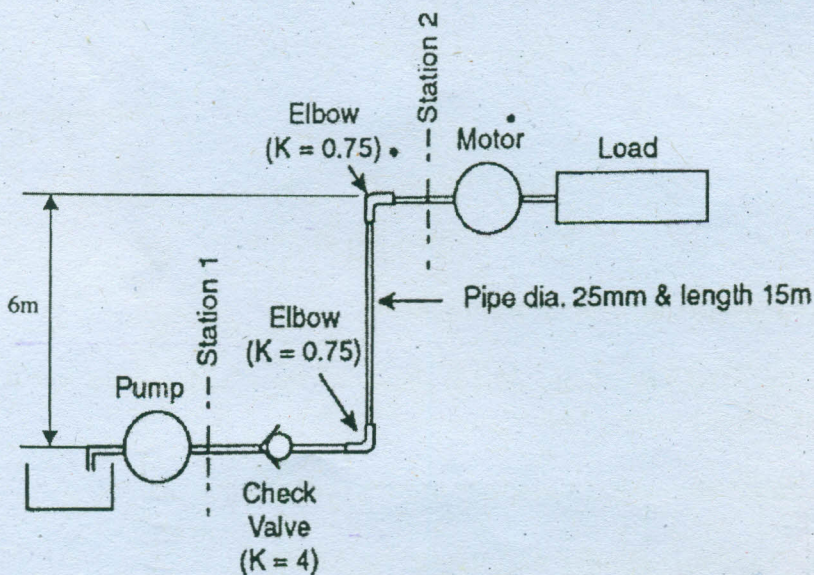

Fig. Q. 11(b) Hydraulic system

12. (a) With a neat sketches, explain the working principle of the following components

    (i)   balanced vane pump   (8)

    (ii) telescopic cylinders.   (8)

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(b) (i) With a neat sketch, explain the cushioning mechanism in a cylinder. (8)

(ii) With a neat sketch, explain the working principle of an external gear motor. (8)

13. (a) Write short notes on :

(i) simple pressure relief valve (8)

(ii) sequence valve. (8)

Or

(b) A pump/accumulator power pack is to supply the fluid flow demanded by a hydraulic system as shown in Fig. Q. 13(b). The system working pressure is 125 bar and the maximum pressure at the accumulator is 200 bar. Assuming the accumulator precharge pressure is 90% of its maximum working pressure, determine

(i) the actual pump delivery required (6)

(ii) the maximum volume of fluid to be stored in the accumulator (6)

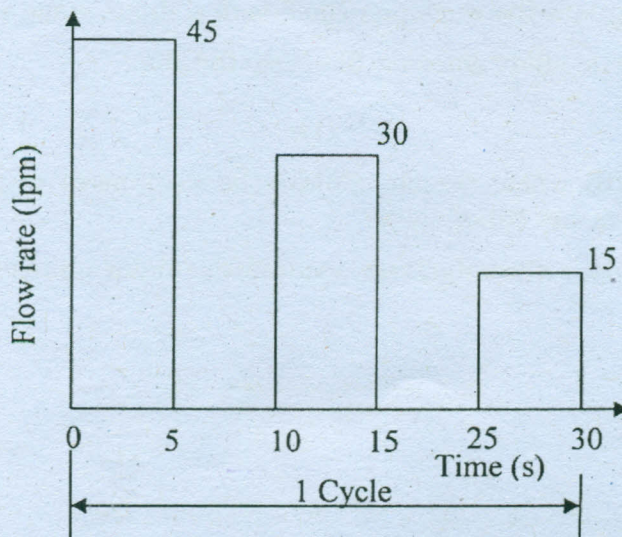(iii) the accumulator volume assuming an isothermal charge and discharge of the accumulator. (4)

Fig. Q. 13(b) Hydraulic system demand

14. (a) (i) Explain the working principle of a reciprocating compressor with a neat sketch. (8)

(ii) Explain the importance of a quick exhaust valve with an industrial example. (8)

Or

(b) A set-up for assembly of component with a base part using a locking pin is shown in Fig. Q. 14(b). The component is fixed on the base part manually. Once the start button is pressed, cylinder 'A' slowly presses the component into the base part, followed by cylinder 'B' which slowly presses the locking pin from the side. After inserting the locking pin, cylinder 'B' retracts followed by cylinder 'A'. Develop a pneumatic circuit for the above operation using Cascade method.
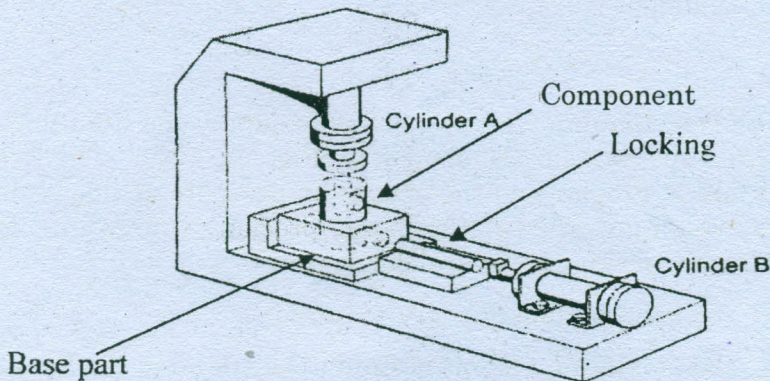

Fig. Q. 14(b) Set-up for inserting locking pin

15. (a) (i) Explain the working principle of a single stage servo valve. (8)

(ii) Write short notes on Bi-stable flip-flop. (8)

Or

(b) (i) With a neat sketch, explain the working principle of a proportional pressure relief valve. (8)

(ii) With a block diagram, explain the major units of a PLC. (8)

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