Question Paper Code : 20803

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Seventh Semester

Mechanical Engineering

ME 6021 — HYDRAULICS AND PNEUMATICS

(Regulations 2013)

Time : Three hours   Maximum : 100 marks

State clearly any assumption made with justification.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What is the basic law that is important in applying fluid power? Define it.

2.   Why hydraulic fluid should have low in volatility?

3.   How offset angle of a swash plate type inline piston pump influence the flow rate?

4.   What is barrel and plunger in telescopic cylinder?

5.   What are the factors to be considered while designing a hydraulic circuit?

6.   What is cross-over pressure relief valve and what is the need of this valve in hydraulic circuit?

7.   What are the advantages claimed by air motor over electrical motor?

8.   Differentiate running torque and stall torque of pneumatic motor.

9.   What is hydraulic power pack?

10. List the advantages of PLC over electromechanical relay control systems.

PART B — (5 × 13 = 65 marks)

11. (a) (i) What are Gas laws? Explain. (6)

(ii) List any seven differences between oil hydraulics and pneumatic system. (7)

Or

(b) (i) With respect to pressure, discharge and the provision of variable displacement compare the positive and non positive displacement pump. (6)

(ii) An input cylinder with a diameter of 30 mm is connected to an output cylinder with a diameter of 80 mm. A force of 1000 N is applied to the input cylinder. What is the output force? How far would we need to move the input cylinder to move the output cylinder 100 mm? (7)

12. (a) (i) Calculate the pipe bores required for the suction and pressure lines of a pump delivering 40 Litre/min using a maximum flow velocity in the suction line of 1.2 m/s and a maximum flow velocity in the pressure line of 3.5 m/s. (6)

(ii) List the various parameters that affects the selection of a particular type of pump. (7)

Or

(b) (i) Using relevant sketch, explain the function of compound pressure relief valve. (8)

(ii) Draw a schematic of 'Pressure reducing valve' and explain its function. (5)

13. (a) Using pilot-operated check valve develop a hydraulic circuit used to hold an over-hauling load. Also explain the function of circuit.

Or

(b) What is a servo valve? Using a suitable sketch explain the function of Mechanical-hydraulic servo valve.

14. (a) (i) Provide the details of classification of compressors. (4)

(ii) How to demonstrate coanda effect? Explain briefly. (4)

(iii) Using pneumatic circuit explain the logic of MEMORY function. (5)

Or

(b) Develop and discuss a circuit of control of single acting pneumatic cylinder using the logic of OR as well as AND. (7 + 6)

15. (a) Using double acting cylinder develop and discuss the hydraulic circuit used in drilling machine.

Or

(b) (i) What is troubleshooting? List the most common causes of hydraulic system breakdown. (2 + 6)

(ii) Write the general rules that are adopted to keep cavitation free pump operation. (5)

PART C — (1 × 15 = 15 marks)

16. (a) Metal sheets are to be flanged on a Pneumatically operated bending tool as shown in the figure. After clamping the component by means of a single-acting clamping cylinder A, it is bent over by a double-acting cylinder B and subsequently finish bent by another double-acting cylinder C. The operation is initiated by a manual button. The circuit is to be designed such that one working cycle is completed each time a start signal is given. Develop the pneumatic circuit for the given sequence of operation using cascade method.
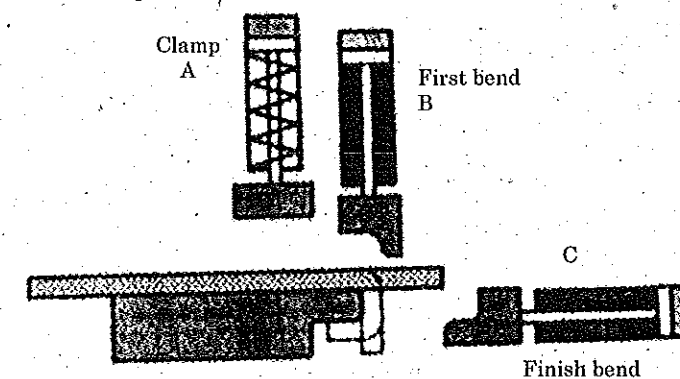
Or

(b) (i) A hydraulic cylinder is designed by having bore diameter of 63 mm and rod diameter of 25 mm which is used in a system with a 4/3 regenerative neutral DCV and a 45 L/min pump. What are the extension speeds when regenerating and when not regenerating? Also find the total flow rate received by the cylinder during regenerative mode. (7)

(ii) A cylinder has a bore of 125 mm diameter and a rod of 70 mm diameter. It drives a load of 2000 kg vertically up and down at a maximum velocity of 3 m/s. The lift speed is set by adjusting the pump displacement and the retract speed by a flow control valve. The load is slowed down to rest in the cushion length of 50 mm. If the relief valve is set at 140 bar, determine the average pressure in the cushions on extend and retract. (Neglect pressure drops in pipe work and valves). (8)