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10ME73

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018

## Hydraulics & Pneumatics

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

### PART – A

1. a. With a neat block diagram, explain the structure of hydraulic power system. (06 Marks)  
b. A gear pump has a 75 mm outside diameter, a 50 mm inside diameter and a 25 mm width. If the volumetric efficiency is 90% at rated pressure, what is the corresponding actual flow rate? The pump speed is 1000 rpm. (04 Marks)  
c. A pump has a displacement volume of 100 cm<sup>3</sup>. It delivers 0.0015 m<sup>3</sup>/s at 1000 rpm and 70 bars. If the prime mover input torque is 120 N.m. Determine  
(i) What is the overall efficiency of the pump?  
(ii) What is the theoretical torque required to operate the pump? (06 Marks)  
d. What are the advantages of hydraulic system? (04 Marks)
2. a. A pump supplies oil at 75.8 litres/min to a 50.8 mm diameter double-acting hydraulic cylinder. If the load is 4448 N (extending and retracting) and the rod diameter is 25.4 mm, find  
(i) The hydraulic pressure during the extending stroke.  
(ii) The piston velocity during the extending stroke.  
(iii) The cylinder power during the extending stroke.  
(iv) The hydraulic pressure during the retraction stroke.  
(v) The piston velocity during the retraction stroke.  
(vi) The cylinder power during the retraction stroke. (09 Marks)  
b. Explain with a neat sketch a Gear Pump. (05 Marks)  
c. A hydraulic motor has a displacement of 164 cm<sup>3</sup> and operates with a pressure of 70 bars and a speed of 2000 rpm. If the actual flow rate consumed by the motor is 0.006 m<sup>3</sup>/s and the actual torque delivered by the motor is 170 NM, find  
(i) Volumetric efficiency.  
(ii) Mechanical efficiency.  
(iii) Overall efficiency.  
(iv) The actual kW delivered by the motor. (06 Marks)
3. a. Explain with neat sketch of  $\frac{3}{2}$  Poppet valve with symbolic representation. (08 Marks)  
b. Explain with neat sketch of pilot operated pressure Relief valve. (07 Marks)  
c. Explain with a neat sketch the working of shuttle valve with symbolic representation. (05 Marks)
4. a. Explain with a neat circuit diagram, the working of double pump hydraulic system. (10 Marks)  
b. Explain with a neat circuit diagram, the counter balance valve application. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.



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**PART – B**

- 5 a. Write any five desirable properties of a hydraulic fluid. (05 Marks)  
b. Explain three basic types of filtering methods used in hydraulic system. (06 Marks)  
c. Explain static seals and dynamic seals with examples. (05 Marks)  
d. Identify the most common causes of hydraulic system break down. (04 Marks)
- 6 a. State five disadvantages of using air instead of hydraulic oil. (05 Marks)  
b. Explain with schematic sketch of FRL unit with ANSI symbol. (09 Marks)  
c. Explain the characteristics of compressed air. (06 Marks)
- 7 a. Explain with a neat circuit diagram, the working of two step speed control system. (10 Marks)  
b. Explain the pressure dependent control of circuit with a  $\frac{5}{2}$  double pilot operated DCV, two  $\frac{3}{2}$  spring return and double acting cylinder. (10 Marks)
- 8 a. Write a brief note on SPST-NO, SPST-NC, DPST-NO/NC, DPDT-NO/NC and LS-NO with symbol of these switches. (10 Marks)  
b. Explain with neat sketch of circuit of sequencing of two pneumatic cylinder that can be done by using Solenoids, limit switches and valves. (10 Marks)

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