Total No. of Questions : 8]

SEAT No. : [ ]

P3600

[Total No. of Pages : 3

[5560]-555
T.E. (E & TC)
MECHATRONICS
(2015 Course) (Semester-I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) A potentiometer which is used to measure the rotational position of a shaft has 850 turns of wire. The input range is from –160° to + 160°.The output range is from 0 to 12V. Determine **[6]**

i) Span of potentiometer

ii) Sensitivity

iii) Average resolution in volts

b) List any six factors which need to be considered while selecting a sensor. **[6]**

c) Determine the force needed to a piston of 2 cm radius in order to result a force of 6000 N at the working piston of radius 6 cm. Calculate the hydraulic pressure in bar. **[4]**

d) Define the following terms with respect to hydraulic pump. **[4]**

i) Volumetric efficiency

ii) Power efficiency

OR

Q2) a) Discuss the phases of mechatronics design process. **[5]**

b) If the spring transducer deflects 0.075 m when a force of 15 kN is applied, find the input force for a displacement of 0.1 m. **[4]**

P.T.O.

c) With the help of a suitable diagram explain the working principle of swash plate axial piston pump. What is the significance of swash angle? **[6]**

d) Write a short note on : **[5]**

i) Accumulator

ii) Mechanical filter

Q3) a) With a suitable diagram explain how double acting piston compressor delivers twice air than single acting piston compressor. **[8]**

b) A pneumatic cylinder is required to move a 750N load 150 mm in 0.5s. What is the output power? **[4]**

c) List two advantages and two drawbacks of pneumatic system over hydraulic system. **[4]**

OR

Q4) a) Explain the working of screw compressor with a neat sketch. **[6]**

b) Demonstrate the working of relief valve. **[6]**

c) What is the difference between free air and standard air? **[4]**

Q5) a) Determine the input pulse rate if the stepper motor has 10°per step and rotating at 300 rpm. **[4]**

b) Explain the construction & working of 5/2-way pilot operated valve. Draw its symbol. **[8]**

c) How relay is used as an electromechanical switch? Explain with suitable sketch. **[6]**

OR

Q6) a) Write a short note on : Hybrid stepper motor. **[4]**

b) With a suitable sketch, explain the working of double acting cylinder. **[8]**

c) Explain the construction & working of non-return valve. Draw its symbol. **[6]**

Q7) a) List six points of comparison between NC, CNC and conventional system. **[12]**

b) Explain the need of following sensors in engine management system. **[4]**

i) Throttle position sensor

ii) EGO sensor

OR

Q8) a) A train is subjected to lateral forces when it passes horizontal curves. This causes severe discomfort to the passengers. Devise a solution to tackle this problem. **[8]**

b) How autonomous ship control system is different than traditional approach? **[8]**