

Total No. of Questions : 8]

SEAT No. :

**P3600**

**[5560]-555**

[Total No. of Pages : 3

**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  $-160^\circ$  to  $+160^\circ$ . 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  $10^\circ$  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]**

