

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 3

P3600

[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 $+160^\circ$. 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]**

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- 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]**

