

Total No. of Questions : 08]

SEAT No. :

P1726

[Total No. of Pages : 3

[5460] - 555
T.E. (E & TC)
MECHATRONICS
(2015 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 , Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Assume suitable data if necessary.*

- Q1)** a) Write a short note on servomechanism. **[6]**
- 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]**
- c) With the help of a suitable diagram explain the working principle of unbalanced vane pump. **[5]**
- d) Describe the working of epicyclical gear train with the help of neat diagram. **[5]**

OR

- Q2)** 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) Explain the working of absolute encoder with a neat diagram. **[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

P.T.O.

- Q3)** a) Explain the working of dynamic compressor with a neat sketch. [6]
b) Demonstrate the working of non-relieving pressure regulator. [6]
c) What is the difference between free air and standard air? [4]

OR

- Q4)** a) With a suitable diagram explain how double acting piston compressor delivers air twice than single acting piston compressor. [8]
b) A pneumatic cylinder is required to move a 750N load 150mm in 0.5s. What is the output power? [4]
c) List two advantages and two drawbacks of pneumatic system over hydraulic system. [4]

- Q5)** a) Explain the following specifications of stepper motor. [4]
i) Phase
ii) Step angle
b) With a suitable sketch, explain the working of single acting cylinder. [8]
c) Explain the construction & working of bidirectional flow control valve. Draw its symbol. [6]

OR

- Q6)** 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]

- Q7)** 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) Design an antilock brake system to prevent the wheels of motor vehicle from locking while braking. [8]

OR

- Q8)** 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) Knock sensor
 - ii) Mass airflow sensor.

