53 (IE 702) INSC

2017

INSTRUMENTATION SYSTEM COMPONENTS

Paper : IE 702

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions out of **seven**.*

1. *(a)* Explain the construction and working of variable reluctance stepper motor. 14

   (b) A stepper motor has a step angle of 5°. Determine *(i)* Number of steps required for the shaft to make 30 revolutions, *(ii)* Resolution and *(iii)* Shaft speed, if the stepping frequency is 3200*pps*. 6

2. *(a)* Derive the transfer function for an armature controlled DC servomotor. 12

(b) Explain the construction and working of AC tachogenerator. 8

3. (a) Design an electronic PD controller using the controller parameters :

$G_p = 10$ and $G_D = 8$. Assume all capacitance as $1\mu F$ and $f_{maxi} = 1kHz$. 12

(b) With a neat diagram, explain pneumatic PD controller. 8

4. (a) Design an electronic PI controller using two operational amplifiers with the controller parameters ; $G_p = 12$ and $G_I = 0{\cdot}3$. Assume all capacitance as $1\mu F$. 10

(b) Explain PID Controller. Draw an electronic PID controller and explain its design procedure. 10

5. (a) Draw and explain a two stage valve using flapper valve and 4 way spool valve. 10

(b) Explain 3 way spool valve. 6

(c) Explain negative feedback principle. 4

6. *(a)* With a neat diagram, explain pneumatic *P* controller. Derive its transfer function. 14

(b) Draw a Pneumatic PID controller. 6

7. Write short notes on : 4×5=20

(a) Synchro transmitter

(b) Servomotor

(c) Hydraulic System

(d) Flapper valve.