

B.E. Mechanical Engineering (Model Curriculum) Semester-IV
PCCME206 - Instrumentation and Control

P. Pages : 2

Time : Three Hours



GUG/W/23/14065

Max. Marks : 80

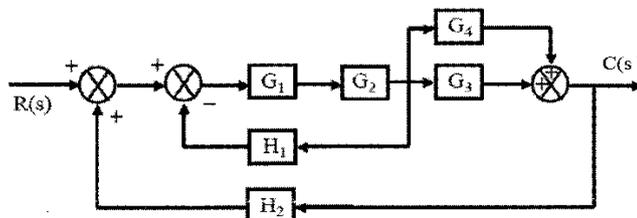
- Notes :
1. All questions carry equal marks as indicated.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Diagrams and Chemical equation should be given wherever necessary.
 5. Illustrate your answers wherever necessary with the help of neat sketches.
 6. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.
 7. Attempt Q. 1 or Q.2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10.

1. a) Explain generalized measurement system with block diagram. **8**
- b) What are the different types of errors in measurements? Describe in detail systematic, random and random types of errors. **8**
2. a) Draw the explain the response of the 1st order system to the step input. Explain steady state error and transient error. **8**
- b) Discuss following dynamic characteristics of the instruments. **8**
Peak overshoot
Dead time and dead zone.
Dynamic error and
Settling time
3. a) Define steady state error. Derive an expression for the steady state error. **8**
- b) A system has $G(S)H(s) = \frac{k(S+4)}{S(S^3 + 5S^2 + 6S)}$ **8**
- FIND
- i) Type of system ii) All static errors
4. a) Find steady state error and error constant for the system whose. **8**
$$G(S) = \frac{49}{S^2(S+7)}$$

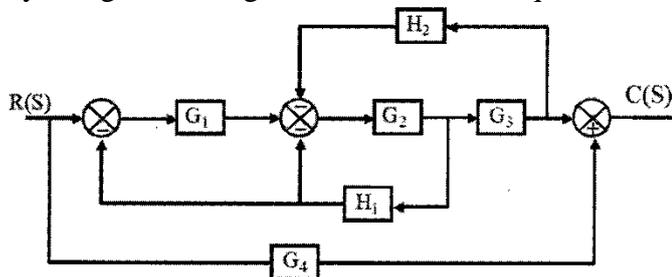
And $H(S) = 1$
- b) Discuss briefly PID Controller. **8**
5. a) Enlist various types of dynamometers and explain with neat sketch rope brake dynamometer. **8**
- b) Explain construction and working of LVDT with its advantages. **8**

6. a) Enlist the various transducers used in speed measurement and explain photoelectric transducer. 8
- b) Following data refers to the test on an engine with rope brake dynamometer 8
 Mass attached to rope = 75 kg,
 Spring balance reading = 1 N
 Flywheel radius = 0.2 meter
 Rope diameter = 2 cm,
 Speed = 480 RPM. Obtain the power of the engine

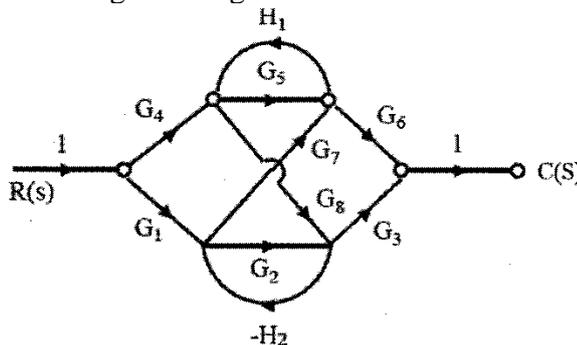
7. a) Differentiate between open loop and closed loop system. 8
- b) Find out Transfer function 8
 $C(s)/R(s)$



8. a) Obtain $C(S) | R(S)$ by using block diagram reduction technique. 8



- b) Find out Transfer function using Mason gain formula. 8



9. a) A unity feedback system has the open loop transfer function $G(s) = \frac{k}{s(s+1)(s+3)(s+4)}$ 10
 Plot the Root locus.

- b) Explain 6
 i) Significance of Root locus ii) Routh's criterion for stability.

10. For unity feedback system, $G(s) = \frac{80}{s(s+2)(s+20)}$ sketch the Bode plot. Find PM and GM of the system and comment upon the stability of system. 16
