

Roll No. ....

**22225**

**M. Tech. 1st Sem. (Mech. Engg.)**

**(Machine Design)**

**Examination – December, 2014**

**MECHATRONICS AND PRODUCT DESIGN**

**Paper : M-809-A**

*Time : Three hours ]*

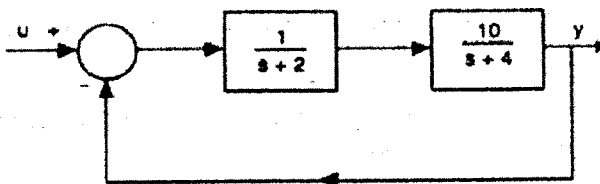
*[ Maximum Marks : 100*

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** Attempt any *five* questions. All questions carry equal marks.

1. (a) Explain the various stages in mechatronics design approach and how it differs from the traditional approach. 10
- (b) Devise an automatic washing machine explaining the various Mechatronics elements used in the design. 10
2. (a) With a neat diagram, describe the working of a solenoid. 10
- (b) Discuss the working of a roller and thrust bearing with suitable diagrams. 10

3. (a) Discuss the static and dynamic characteristics of sensors. 10
- (b) What is RTD ? Briefly explain the relationship between resistance and temperature for the RTD with temperature resistance curve. 10
4. Suggest a sensor whose output is an electrical signal for the following and explain them in detail.
- (a) Vacuum pressure measurement in the range of  $10^{-2}$  to  $10^{-6}$  torr.
- (b) Velocity of hot gas in a conduit. 20
5. (a) Explain electronic proportional derivative (PD) controller with necessary circuit diagrams. 10
- (b) Draw the circuit of a counter type A/D converter and explain its operation. 10
6. A feedback control system has transfer function of  $G(s) = \frac{s^2 + 3s + 2}{s(s^2 + 7s + 12)}$ . Derive two different state models for the system. giving the state-equations for each model. 20



7. Explain the model building using the basic building blocks for a
- (a) Automobile suspension system
  - (b) Electrical motor 20
8. (a) Write short notes on encoders and decoders. 5
- (b) Explain the Mechatronics systems used in an automatic car parking with a neat block diagram. 15
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