| Reg. No. | | | | | | | | | | | | |
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| Question Paper Code | 12100 |
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28 JUL 2023

**B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023**

Fourth Semester

**Mechanical Engineering**

**20MEPC401 - MEASUREMENT AND CONTROL SYSTEMS**

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

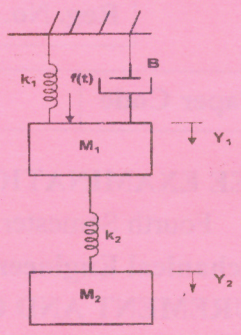
Answer ALL Questions

| | | Marks, K-Level, CO |
|---|---|---|
| 1. | Compare accuracy and precision. | 2,K2,CO1 |
| 2. | Why calibration of measuring instruments done periodically? | 2,K1,CO1 |
| 3. | Define open loop and closed loop system. | 2,K1,CO2 |
| 4. | Write the Mason's Gain Formula. | 2,K1,CO2 |
| 5. | What is transient and steady state response? | 2,K1,CO3 |
| 6. | Name the test signals used in control system. | 2,K1,CO3 |
| 7. | Mention the frequency domain specifications. | 2,K1,CO4 |
| 8. | The damping ratio and natural frequency of oscillation of a second order system is 0.5 and 8 rad/sec respectively. Calculate the resonant peak and resonant frequency? | 2,K2,CO4 |
| 9. | What are the different types of Load cell? | 2,K1,CO5 |
| 10. | What is the principle of LVDT? | 2,K2,CO5 |

**PART - B (5 × 13 = 65 Marks)**

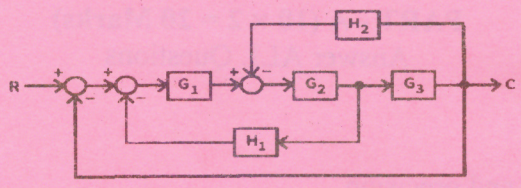
Answer ALL Questions

| | | | |
|---|---|---|---|
| 11. | a) | Explain the functional blocks of a measurement system with a neat diagram. | 13,K2,CO1 |
| | | **OR** | |
| | b) | By using a micro meter screw, the following readings were taken of a certain length:1.34, 1.38, 1.56, 1.47, 1.42, 1.44, 1.53, 1.48, 1.40, 1.59 mm. Calculate the following: a) Arithmetic mean, b) Average deviation, c) Standard deviation and d) Variance. | 13,K3,CO1 |
| 12. | a) | Write the differential equations of the mechanical system shown in below fig and draw the force-voltage; force-current analogous circuit and verify by writing Mesh and Nodal equations. | 13,K3,CO2 |




**OR**

b) Find C/R using block diagram reduction. *13,K3,CO2*




13. a) Derive the expression and draw the response of second order system for under damped case with unit step input. *13,K3,CO3*

**OR**

b) Obtain the response of unity feedback system whose open loop transfer function is G(s)= 4/s(s+5) and when the input is unit step. *13,K3,CO3*

14. a) Sketch the bode plot for the following transfer function and determine the system gain K for the gain cross over frequency to be 5rad/sec. G(S)=K/S(S+4)(S+10). *13,K3,CO4*

**OR**

b) Sketch the polar plot for the following transfer function and find Gain cross over frequency, Phase cross over frequency, Gain margin and Phase margin. G(S)=1/S(1+S)(1+2S). *13,K3,CO4*

15. a) With suitable diagram explain how AC and DC tachometer generators are used to measure speed. *13,K2,CO5*

**OR**

b) Explain how the torque is measured by strain gauge and relative angular twist. *13,K2,CO5*

**PART - C (1 × 15 = 15 Marks)**

16. a) Explain how McLeod gauge used for low pressure measurement. Justify this with your answer. *15,K2,CO6*

**OR**

b) How thermocouple is used to measure temperature? Explain the basic principle behind the thermocouple. Write its advantages and disadvantages. *15,K2,CO6*