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Question Paper Code	12201
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023**  
 Seventh Semester  
**Production Engineering**  
**PR8003 - INSTRUMENTATION AND CONTROL**  
 (Use of Graph sheet, Semi log sheet and Polar graph is permitted)  
 (Regulations 2017)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**  
 Answer ALL Questions

- |   |                    |
|---|--------------------|
|   | <i>Marks,</i>      |
|   | <i>K-Level, CO</i> |
| 1. State the desirable and undesirable characteristic of an instrument. | <i>2,K1,CO1</i>    |
| 2. How accuracy differs from precision?                                 | <i>2,K2,CO1</i>    |
| 3. Classify temperature sensors based on range of measurement.          | <i>2,K2,CO2</i>    |
| 4. Draw two types of strain gauges used for force measurement.          | <i>2,K1,CO2</i>    |
| 5. Brief the principle of X-Y recorder.                                 | <i>2,K2,CO3</i>    |
| 6. List the merits and demerits of LED.                                 | <i>2,K1,CO3</i>    |
| 7. Define damping ratio.  | <i>2,K1,CO4</i>    |
| 8. List the advantage of obtaining state space model.                   | <i>2,K1,CO4</i>    |
| 9. Define Phase margin.   | <i>2,K1,CO5</i>    |
| 10. What are the effects of adding a zero to a system?                  | <i>2,K2,CO5</i>    |

**PART - B (5 × 13 = 65 Marks)**  
 Answer ALL Questions

11. a) Explain the desirable and undesirable characteristics of the measurement system and also mention its importance *13,K2,CO1*
- OR**
- b) Temperature of a metal bath is measured 100 times with variation in apparatus, procedures and persons. The reading are tabulated below *13,K2,CO1*

Temp °C	397	398	399	400	401	402	403	404	405
Freq.	1	3	12	23	37	16	4	2	2

Find (i) Mean (ii) Mode (iii) Mean deviation (iv) Standard deviation (v) probable error of one reading (vi) Variance.

12. a) Explain any two methods to measure acceleration with the help of neat diagram. *13,K2,CO2*

OR

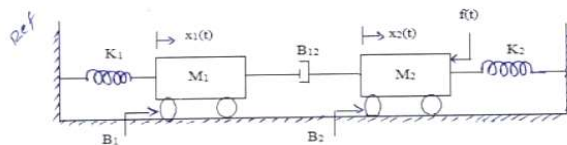
b) Explain the methods used for measuring stress and strain. 13,K2,CO2

13. a) With a help of a schematic diagram, explain the working of a CRT. 13,K2,CO3

OR

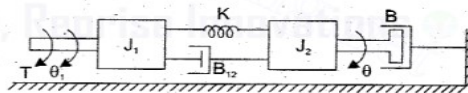
b) Classify the recorders and describe the working of XY recorders with neat diagram. 13,K2,CO3

14. a) Draw the equivalent Force-voltage analogy for the mechanical system shown 13,K3,CO4



OR

b) Write the differential equation governing the mechanical rotational systems and determine the transfer function of  $\frac{\theta(s)}{T(s)}$ . 13,K3,CO4



15. a) For the unity feedback control system  $G(s) = \frac{20}{s(1+3s)(1+4s)}$  13,K3,CO5  
Draw the bode plot.

OR

b) The open loop transfer function of a unity feedback control system is given by  $G(s) = K / (s^5 + 7s^4 + 6s^3 + s^3 + s^2 + 6s + 25)$ . By applying the Routh criterion, discuss the stability of the closed loop system as a function of K. Determine the values of K which will cause sustained oscillations in the closed loop system. 13,K3,CO5

**PART - C (1 × 15 = 15 Marks)**

16. a) Derive the expression to find peak overshoot and rise time. 15,K2,CO5

OR

b) Draw the Nyquist plot for the system whose open loop transfer function is  $G(s)H(s) = \frac{K}{s(s+2)(s+10)}$  15,K2,CO5