

P4767

[Total No. of Pages : 3

[5060]-591

M.E. (Mechanical - Design Engineering)

MECHANICAL MEASUREMENT & CONTROL

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:-

- 1) Answer any five questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

Q1) a) Explain following static characteristics of measuring instruments. **[5]**

- i) Sensitivity
- ii) Hysteresis
- iii) Repeatability
- iv) Drift

b) Explain following: **[5]**

- i) Mean
- ii) Median
- iii) Standard Deviation
- iv) Variance

Q2) a) Calculate standard deviation (σ) and variance (V) for following measurement sets

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409 406 405 409 406 407. **[6]**

b) Explain properties of regression and correlation coefficient. **[4]**

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Q3) a) By using following data find lines of regression & Compute Karl Pearson coefficient of correlation. [6]

$$\Sigma x = 250 \quad \Sigma y = 300 \quad \Sigma xy = 7900 \quad \Sigma x^2 = 6500 \quad \Sigma y^2 = 10000 \quad n = 10.$$

b) Explain Sources of Systematic Error. [4]

Q4) a) How the temperature of metal slab can be measured? Draw setup required for that and explain working. [5]

b) For vibration measurement which parameters are measured? Explain piezoelectric accelerometer with neat sketch. [5]

Q5) a) List out various methods of level measurement. Explain any one in detail. [5]

b) List out various instruments for frequency measurement. Explain stroboscope in detail. [5]

Q6) a) Figures Q 6 (A) shows an error time graph. Sketch the PD controller output w.r.t. time $K_p = 5\%/ \%$, $K_D = 0.5\%/s$ and $m(0) = 30\%$. [5]

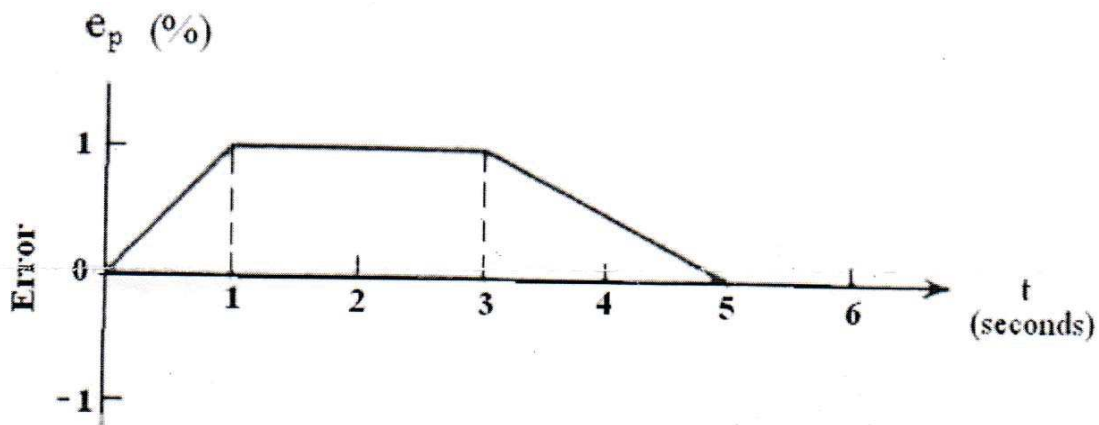


Figure Q6 (A)

b) Explain transient response specifications. [5]

- Q7) a)** Characteristic equation of system is given by $s^3 + 101.3s^2 + 132s + 5.093k = 0$. Find value of k , if system is stable by using Routh Hurwitz criterion. **[5]**
- b)** Derive the transfer function between output θ and input τ for the single DOF rotational system shown in Figure Q7 (b). **[5]**

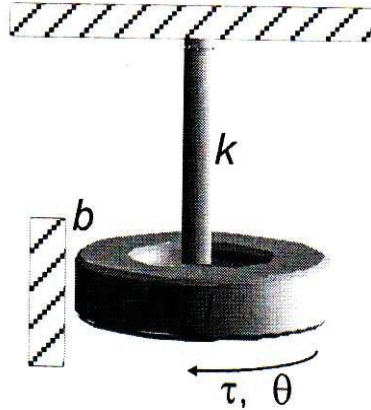


Figure Q7 (B)

- Q8) a)** Explain Proportional + Integral + Derivative Controller. **[6]**
- b)** Define Gain Margin & Phase Margin. **[4]**

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