**Section I [07\*1 = 07 Marks]**

1. The noise factors can be:

(a) External (b) unit to unit variation (c) Deterioration (d) All of these.

1. What are the factors in engineering system so that it can affect response?

(a) Noise factors, Signal Factors (b) Signal factors, control factors (c) control factors and noise factors (d) all of the above

1. Taguchi's quality loss function is based on a

(a) Binomial distribution (b) quadratic distribution (c) Poisson distribution (d) exponential distribution

1. The Taguchi method includes three major concepts. These include all of the following, except

(a) Quality robustness (b) employee involvement (c) target-oriented quality (d) quality loss function

1. The equations for the Nominal is better is (y= output value, m = target value of output, k = constant):

(a) L= k(y-m)2 (b) L = k y2  (c) L = k/y2 (d) none

1. Choose the correct graph for Quality loss function (smaller is better).



1. Convex hull property is satisfied by the following surface:

a) Bezier b) B-spline c) NURBS d) All of these

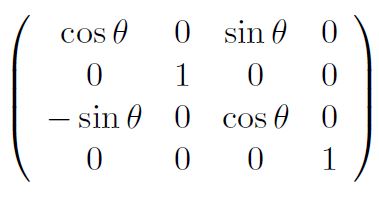
1. What rotation does the transformation matrix represent?

(a) a rotation through around the x-axis

**(b) a rotation through around the y-axis**

(c) a rotation through around the z-axis

(d) a rotation through around the -x-axis



**Section II [5\*5 = 25 Marks]**

1. For a cutting of magnetic material, laser beam machining was used. There were four controllable parameters gas pressure (A), pulse width (B) , pulse frequency (c) and cutting speed (D). For a better quality of cutting two outputs (quality characteristics) kerf width and Material removal rate were measured. For a particular set of input parameters, the values of kerf width and Material removal rate is given below. Each characteristics were measured two times (trial 1 and 2) at same set of input parameters. Calculate the quality loss function for kerf width taking smaller is better (SB) and for MRR taking Larger is better (LB).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | Quality loss values (dB) | | | |
|  | | | | Kerf Width (mm) | | MRR (mg/min) | |
| Trial 1 | Trial 2 | Trial 1 | Trial 2 |
| 2.4 | 1 | 75 | 100 | 0.39 | 0.385 | 44.9375 | 44.856 |

1. A Company received an average of 10 complaints per month last year. In November they received 25 complaints (y). Management sets an acceptable level at 3 (tolerance). It costs the company $50 directly per complaint to correct the problems. They determined the cost in lost sales to be $100. Total cost per complaint: $250. Estimate the quality loss for the month November.
2. Marlon Audio Company manufactures cassette tapes. The desired speed of its model SF2000 is 2 inches per second. Any deviation from this value distorts pitch and tempo resulting in poor sound quality. The company sets the quality specification to 2 0.25 inches per second because an average customer is likely to complain and return the tape if the speed is off by more than 0.25 inch per second. The cost per return is $36. The repair cost before the tape is shipped, however, is only $3 per tape. Compute *L* (x*)* if *x* is 2.12 inches per second.
3. A firm has determined that no customer will accept sheet metal deviating more than 0.05 inch from the target value in thickness, that the target thickness is 0.5 inch, and that the estimated cost to the firm is $5,000 for each rejection by a customer. The $5,000 cost to the firm includes repair or replacement, processing, service costs, and other costs due to customer dissatisfaction. Estimate the total loss for the unit if actual thickness of a unit is 0.47 inch.
4. From the below table, calculate the loss per unit of plant A and B using variance and the square of the mean deviation from the target value.

|  |  |  |  |
| --- | --- | --- | --- |
| Measured Thickness | Quality Loss  ($) | Plant A (probability) | Plant B (probability) |
| 0.43 | 9800 | 0 | 0.02 |
| 0.46 | 3200 | 0.2 | 0.03 |
| 0.48 | 800 | 0.2 | 0.15 |
| 0.50 | 0 | 0.2 | 0.6 |
| 0.52 | 800 | 0.2 | 0.15 |
| 0.54 | 3200 | 0.2 | 0.03 |
| 0.57 | 9800 | 0 | 0.02 |