B.E. PRODUCTION ENGINEERING - SECOND YEAR - SECOND SEMESTER

INSPECTION AND PRODUCT CONTROL

Time : Three hours   Full marks: 100

Question No. 1 is compulsory. Answer any five from Question No. 2.

1.(a) While choosing an instrument for a specific measuring application, what are the characteristics need to be considered?   (5×10)

(b) With real time examples, differentiate between interpolation and extrapolation methods of measurement.

(c) With a neat sketch, illustrate Indian standard for shaft and hole assembly.

(d) Mention about the advantages and disadvantages of having rough surface.

(e) Draw the cause and effect diagram for having excessive tapered jobs being produced during the turning operation.

(f) Between Cp and RPI, which one is more preferred and why? Provide some suggestions so as to increase the Cp value of a manufacturing process.

(g) For a rough surface, the values of 10 consecutive peaks and valleys are observed as follows (in μm). Determine the corresponding Rz value.
Peaks: 1.2, 1.4, 2.5, 2.2, 3.3, 2.1, 3.4, 2.6, 3.0, 5.2
Valleys: 1.1, 1.9, 2.0, 2.9, 3.2, 1.2, 3.8, 2.3, 3.4, 0.2

(h) How flatness and perpendicularity errors can be measured using a coordinate measuring machine?

(i) Differentiate between single- and double-ended snap gauges? What are the measures taken to reduce wear and tear in plug and ring gauges?

(j) What are the advantages and disadvantages of a mechanical-electrical type comparator?

2.(a) What a neat sketch, describe the working principle of any non-contact measuring instrument.   (10×5)

(b) Write short notes on: (i) defect concentration diagram, (ii) merits and demerits of plug gauge.

(c) Describe how surface photographs help in evaluating roughness of a machined job. How would you differentiate between convex and concave surfaces based on their similar fringe patterns?

(d) Mention about different assignable causes which may present in any of the manufacturing processes. How would you minimize those assignable causes?

(e) Mention five areas of application of C chart. What are the limitations of X-bar and R charts?

(f) Two mating parts, A and B have an average clearance specified as 0.05 mm. Control charts indicate the standard deviation of the dimensions of A and B to be 0.02 mm and 0.03 mm respectively. Find the probability of interference between the two distributions. Assume the distributions to be normal. Given $\varphi(-1.38696) = 0.0823$.

(g) Determine the GO and NOGO dimensions of standard gauges to control the production of 60 mm. shaft and hole pairs of H_8e_9 fit as per I.S. specifications given as below:
(i) 60 mm. lies in the diameter step of 50 and 80 mm.
(ii) Fundamental deviation of 'e' type shaft is $-11 D^{0.41}$
(iii) Wear tolerance = 10% of the gauge tolerance.

(h) During measurement, what are the different sources of error? How would you minimize those errors?