

M.Tech-1st(ME-PE) (Set-Q₁)
Inspection and Quality Assurance

Full Marks : 70

Time : 3 hours

Answer Q. No. 1 and any five of the remaining seven questions

The figures in the right-hand margin indicate marks

- I. Answer in brief the following questions : 2×10
- What do you understand by interchangeability?
 - What is tolerance and why is it specified on a job to be manufactured?
 - Distinguish between line standard and end standard.
 - Differentiate between clearance and allowance.
 - What is a limit gauge and what does it check?

(Turn Over)

(2)

- Distinguish between roughness and waviness of a machined surface.
 - Distinguish between quality of conformance and quality of performance.
 - What do you mean by chance causes and assignable causes of variation?
 - Distinguish between reliability and quality.
 - Distinguish between defects and defectives. What are the corresponding control charts called?
2. (a) State the Taylor's principle of limit gauge design. 2
- (b) Design the limit gauges (both plug and ring gauges) to control the production of 50 mm shaft and hole pair designated by 50 H₇d₈. The following assumptions may be made :
 50 mm diameter lies in diameter steps of 30 mm and 50 mm,
 The upper deviation for 'd' shaft is given by -16 D^{0.44} and the lower deviation of the hole 'H' is zero.

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(3)

The fundamental tolerance unit, J (microns) = $0.45\sqrt{D} + 0.001D$ and $IT6 = 10J$. Above $IT6$ grade the tolerance magnitude is multiplied by 10 at 5th step. Also show the tolerance disposition hole and shaft for the fit. 8

- (a) Explain the terms 'Primary texture' and 'secondary texture' of a machined surface and the causes of their development. 4
 (b) Explain the working principles of a Talysurf used to measure the surface roughness. 6
- (a) Define reliability and state the four important factors associated with reliability. 4
 (b) It is found that the random variations with respect to time in the output voltage of a particular system are exponentially distributed with a mean value of 100 V. What is the probability that the output voltage will be found at any time to lie in the range 90-110 V? 6

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(4)

5. In a factory producing spark plug the number of defectives found in inspection of 20 lots of 100 each is given below :

Lot No.	No. of defectives	Lot. No.	No. of defectives
1	5	11	4
2	10	12	7
3	12	13	8
4	8	14	3
5	6	15	3
6	4	16	4
7	6	17	5
8	3	18	8
9	3	19	6
10	5	20	10

- Determine the control limits of appropriate control chart and state whether the process is in statistical control. 5
 - Determine the sample size when a quality limit not worse than 9% is desirable and a 10% bad product will not be permitted more than three times in thousand. 5
6. (a) What are the advantages and limitations of acceptance sampling over 100% inspection? 5

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(5)

- (b) Design a single sampling plan by attributes which will conform to the following requirements : 5
- $\alpha = 0.05, \beta = 0.10$
 $p_1 = 0.008, p_2 = 0.04$

- (a) What is Kaizen system and what are its key elements and benefits? Explain. 5
 (b) What do you mean by ISO-9000 series? State its benefits. 5
- Write short notes on : 10
 (i) Selective Assembly
 (ii) Quality circle.

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