Registration No. :

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Seventh Semester (Special) Examination – 2013
METROLOGY, QUALITY CONTROL AND RELIABILITY
BRANCH : MECH
QUESTION CODE : D 443
Full Marks – 70
Time : 3 Hours

*Answer Question No. 1 which are compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2×10
    (a) Distinguish maintainability and availability.
    (b) What is understood by nominal dimension and actual dimension ?
    (c) Define control limit.
    (d) What is the purpose of thread micrometer ?
    (e) Name the elements of gears which are checked for accuracy.
    (f) What is the need of lower control limit on a P-chart ?
    (g) What do you understand by OC curve ?
    (h) What is Taguchi loss function ?
    (i) What do you mean by bath tube curve ?
    (j) Why is it essential to estimate the reliability ?

2. Design the general type Go and Not-Go gauge for checking the assembly
    30 H7/g8. Given that :

    30mm lies between the range of 18-30mm.

    $i = 0.45(D)^{1/3} + 0.001(D)$ micron

    Fundamental deviation for H hole = 0

    Fundamental deviation for g shaft = $-5.5D^{0.41}$

    IT7=16i and IT8= 25i

    Wear allowances is 10% of gauge tolerances.

    Determine type of fit, allowances for the fit and equivalent fit in shaft base
    system.   10

3. (a) Define end standard and explain how line standard transfer into end standard? 5

   (b) Describe the principle of measurement of roughness using a stylus type instrument. 5

4. (a) Differentiate between interchangeability assembly and selective assembly. 4

   (b) Explain Tylor's principle applied to design limit gauges. 6

5. A process has a good control when controlled between 3-sigma control limits of 118 and 124. The sample size is 4. 10

   (a) What is the standard deviation of the process ?

   (b) What are the control limits on an R-chart ?

   (c) Can this process be used when the specification limits are 116 and 128 ?

6. (a) What is AOQL ? 2

   (b) A double sampling plan is as follows :

   Select a sample of 2 from a lot of 20. If both the articles are good, accept the lot. If both are defective, reject the lot. If one is good, take a second sample of one article. If the article in the second sample is good, accept the lot.

   If a lot of 25% defective is submitted, what is the probability of the acceptance ? Use the combinatorial formula to evaluate the probability. 8

7. (a) Define reliability and methods of arranging the components in the system of reliability. 5

   (b) Explain the acceptance sampling plan based on life tests. 5

8. Write short notes on any four of the following : 2.5×4

   (a) Process capability

   (b) ANOVA

   (c) Orthogonal arrays

   (d) Multiple sampling plan

   (e) Markov model.