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# 229301

**May, 2019**

**M.Tech. (M & A) - III SEMESTER (Reappear)**

**Advanced Metrology and Calibration (MMA-201)**

Time : 3 Hours]

[Max. Marks : 75

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

## PART–A

**1.** (a) What is the effect of tolerance on fits? (1.5)

(b) What do you mean by geometrical tolerance? (1.5)

(c) What do you mean by hybrid parameters in surface roughness measurement? (1.5)

(d) What do you mean by grades of slip gauge? (1.5)

(e) What is the principle of micrometer? (1.5)

(f) What is the difference between straightness and flatness? (1.5)

(g) What do you mean by calibration of measuring instruments? (1.5)

(h) What is the accuracy of surface plate? (1.5)

(i) What is the use of Pin gauge? (1.5)

(j) What is the difference between accuracy and precision? (1.5)

## PART–B

**2.** (a) Discuss the different allowances that must be taken into account in the manufacturing of a gauge. (3)

(b) Determine that actual dimensions to be provided to be provided for a shaft and hole of 90 mm size for Hge9 type clearance fit size 90 mm falls in steps of 80 and 100.

Value of tolerance unit $I = 0.45 (\sqrt[3]{D}) + 0.001D$.

Value of tolerance for IT8 and IT9grades are 25i and 40i. Value of fundamental deviation for 'e' type shaft is $-11D^{0.41}$.

Also design the GO and NO GO gauges. (12)

**3.** (a) Discuss the different types of surface errors and their reasons. (5)

(b) What do mean by bearing ratio? Discuss the utility of ABBOT-Firestone curve and how this curve is drawn? (10)

**4.** (a) Define the flatness. Explain any one method of flatness measurement with advantage and disadvantage? (7)

(b) Describe with sketch the working principle of autocollimator with applications. (8)



**5** (a) What is the need of calibration? Explain the calibration of vernier caliper calibration using slip gauge. (8)

(b) Explain with the neat sketch the working principle of tool makers microscope. (7)

**6.** What is the purpose of gauge? Describe the different types of gauges with neat sketches. (15)

**7.** What causes measurement uncertainty? How do you measure the uncertainty of micrometer, vernier calliper and CMM? (15)